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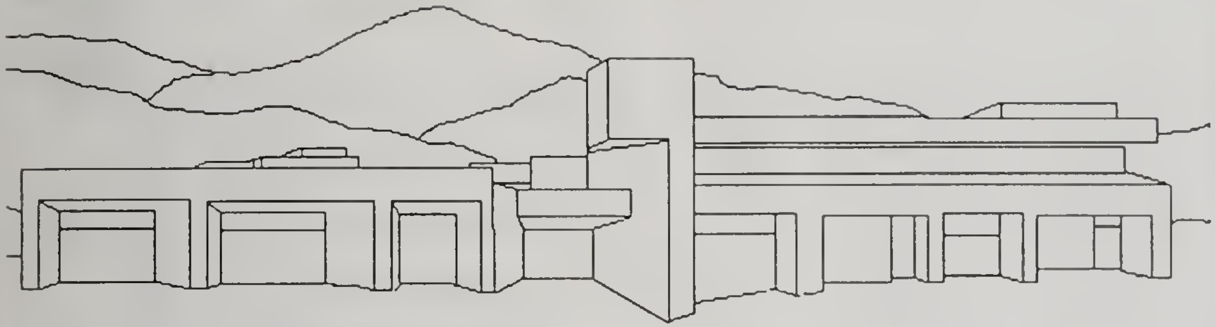

Montana Natural Resource Information System

Fiscal Year 1993 Annual Report

NRIS

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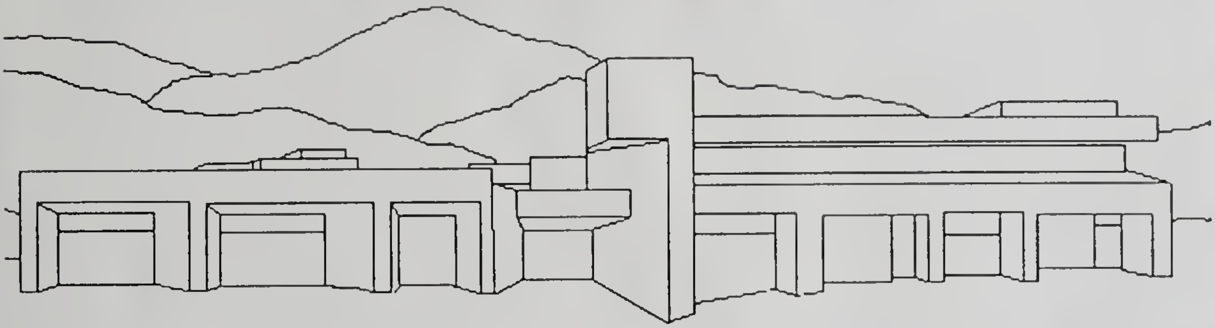

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INTRODUCTION

The Montana Natural Resource Information System (NRIS) was formed in response to the growing need for quick access to the increasing amounts of natural resource information. NRIS was designed to be a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana. In 1985, NRIS began by providing services through its Montana Natural Resource Index and the Montana Natural Heritage Program. In response to growing user needs, the program has expanded to include the Montana Water Information System and the NRIS Geographic Information System. NRIS now offers a wide variety of data management, information indexing, and data retrieval services.

Over the years, NRIS has striven to meet the growing information needs and challenges of Montana's governmental agencies, private business, and general public by developing new services. During the past year, the NRIS staff developed a revised mission statement to more accurately reflect NRIS's current capabilities.

NRIS Mission Statement

The Montana Natural Resource Information System provides comprehensive access to information about Montana's natural resources to all Montanans through the acquisition, storage, retrieval, and dissemination of that information in meaningful form.

Fiscal year 1993 was a busy year for NRIS. We filled over 1400 requests for natural resource information. The **Natural Heritage Program** responded to over 600 information requests and published more than 20 reports. Of particular note is that the Heritage Program's database has been loaded onto the U.S. Forest Service (USFS) Region I mainframe computer in Missoula. Now USFS personnel in all of Region I--down to the Ranger District level--can directly access the Natural Heritage database. The **Water Information System** responded to nearly 300 information requests, conducted the second year of the Drought Monitoring System, and began work on a Groundwater Atlas for Montana. The **Geographic Information System** responded to over 500 service and information requests while successfully working on over 15 separate GIS projects.

This annual report presents the past year's activities for the overall NRIS program, the Natural Heritage Program, the Water Information System, and the Geographic Information System. Each program report describes the major goals for FY 1993, details the many accomplishments, and outlines goals for FY 1994. The appendices contain a report on the NRIS patron evaluations, system usage graphs, examples information requests filled during the year, sample maps, and listings of new information resources. ■

NRIS

NATURAL RESOURCE INFORMATION SYSTEM

The Natural Resource Information System's most visible services are provided through its programs: the **Natural Heritage Program**, the **Water Information System**, and the **Geographic Information System**. However, its principle mission and many of its activities are conducted under the general umbrella of NRIS and the Natural Resource Index. This section of the report reviews the NRIS goals for the last fiscal year, describes our accomplishments, and lists goals for FY 1994.

1993 GOALS

Manage a timely, cost-effective clearinghouse and referral service to link users with the best sources of information.
The principle goal of NRIS is to be "a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana" (90-15-301(1), MCA). NRIS carries out this mandate through all of its programs and through the Montana Natural Resource Index. NRIS will continue to maintain, refine and index existing documents and other natural resource data sources, including both published and unpublished sources.

Participate in the design and development of uniform, easily accessible, statewide databases for each of Montana's natural resources.
NRIS serves as a liaison to and coordinates among agencies that collect, manage, or use the same types of natural resource information to prevent the duplication of effort and to promote information sharing. In addition, NRIS continues to provide technical assistance to agencies to better manage natural resource information. NRIS is committed to continue to provide coordination and technical assistance.

Maintain, refine, and continue to operate the Montana Natural Heritage Program.
NRIS is required to operate the Montana Natural Heritage Program (90-15-302(1), MCA). The Heritage Program is "a program of information, acquisition, storage, and retrieval for data relating to the flora, fauna, and biological community types of Montana." (90-15-101(3), MCA). NRIS is committed to the continued operation and success of the Heritage Program.

Maintain, refine, and continue to operate the Montana Water Information System.
NRIS developed its Water Information System (WIS) based on the needs expressed in a user assessment conducted in 1985. The WIS is a data clearinghouse and referral service linking patrons with the best sources of information. The system supplies information on surface water, ground-water, water quality, snow pack and water rights. NRIS is committed to operating and ensuring the success of the Water Information System in meeting patron needs.

Maintain, refine, and continue to operate the Montana Geographic Information System.
The NRIS Geographic Information System (GIS) was created in 1987 to provide GIS support to the Upper Clark Fork Superfund sites. The system has developed into an integrated database about Montana's geographic features along with powerful analytical and cartographic capabilities. GIS services are now provided to a wide range of public sector, private sector, and general public users. NRIS is committed to the continued successful operation and improvement of the Geographic Information System.

Continue to improve NRIS services and access to information.

Information resources and needs are increasing rapidly and NRIS will explore and develop better services for it's patrons.

Increased Integration Into State Library and the Montana Library Community

A large part of NRIS's success in serving its patrons comes from its placement in the neutral environment of the State Library. We will continue to acknowledge and build on this strength through more integration with other Library programs.

MNRI Conversion to WLN

NRIS will continue to convert its Montana Natural Resource Index to WLN to make the information more available to Montanans.

GIS in Libraries

NRIS will continue to expand the installed base of libraries using the ArcView™ GIS interface program. This expansion will allow more access to natural resource and geographic information in a meaningful form.

1993 ACCOMPLISHMENTS

Most of NRIS's accomplishments are reflected in its three principle programs: the Natural Heritage Program, the Water Information System, and the Geographic Information System. However, some of our accomplishments encompass all of the programs.

Conversion to WLN

In 1992, NRIS began migration from the in-house Montana Natural Resource Index (MNRI) to the more powerful and accessible WLN library network. WLN is a regional bibliographic index available either on-line or via stand-alone PC workstations (*LaserCat*) using CD ROM technology. Over 50 Montana libraries have *LaserCat* stations. These libraries provide ready access, nearly anywhere in the state, to natural resource information for state agency personnel, the private sector, and the general public. Not only is information access in Montana improved, but WLN is found throughout the Pacific Northwest. The network allows patrons in the Northwest to query Montana library holdings and for Montana patrons to query library holdings throughout the region.

The NRIS Administrative Assistant (Pam Smith) has become proficient with WLN. She regularly catalogs documents for entry and in particular, she is entering citation information for publications and reports of the Natural Heritage Program. Copies of these publications are made by NRIS and placed on the shelf in the State Library. NRIS identified the methods needed to convert the bulk of its MNRI listings to WLN and will continue that process in FY 1994.

Public Access to Information

NRIS has been working to provide more direct public access to natural resource and geographic information in a variety of ways:

- NRIS instituted a new project in 1992 called *GIS in Libraries: Public Access to Public Data*--an innovative program that uses ArcView- GIS software to access geographic data. We placed a Unix graphics workstation in the reference section of the State Library to provide on-line access to NRIS's geographic data. This workstation now receives regular usage by state agency personnel as well as the general public. Several new datasets were made available via the workstation during FY93. Montana Census data used by the Legislative Council for legislative redistricting and apportionment were loaded onto the NRIS GIS. National and global data were added using compact disks donated by ESRI, Inc. Other NRIS data accessible from the workstation include general Montana statewide information, the Montana Drought Monitoring System monthly reports, U.S. Geological Survey map information, and community databases. A second one-day, in-house training session for library staff was held in FY93. Workshops on using ArcView- software were presented to the Montana Library Association, and to the WLN Off-line Retreat.

- In addition to access to NRIS data using ArcView-, NRIS began allowing direct hands-on usage of its Arc/Info GIS software via the public access graphics workstation. This access is growing and has been used by both state agency personnel as well as public interest groups. Extensive access is available to anyone who knows how to use a Unix workstation and Arc/Info. NRIS staff is available to solve problems and help users get started. We anticipate use of this service will grow significantly in the coming year.

- NRIS continued to participate in the national *GIS Literacy* project sponsored by the Association of Research Libraries. In that project, 90 research libraries across the country are using ArcView™ on PCs to provide access to census data and maps.

- During FY93, NRIS gained access to Internet, a global computer network. The Internet connection is used for by NRIS both for electronic mail and to search a wide variety of databases and library holdings across the nation.

- In the spring of 1993, we worked with the Information Services Division to load information on the state computer bulletin board system. This information included the NRIS factsheets, NRIS telephone numbers, the GIS newsletter, and the 1992 and 1993 Montana Drought Information.

- While patrons may still request that the Water Specialist conduct a database search and extract required data, patrons now have the opportunity to directly access water data via a pubic access PC. The PC allows users to access compact disk databases or connect on-line to remote databases. This new service is receiving regular use, particularly by the state agency personnel.

Patron Evaluations

In a continuing effort to improve service and assess program effectiveness, NRIS initiated a patron service evaluation survey in FY93. A cover letter and survey form is delivered to each patron when their information or service request is filled (see Appendix A). After a full year of receiving evaluations, returns indicate that NRIS is fulfilling a valuable service in a timely fashion. We received 48 forms during the year. Of those, only 2 indicated some problem with the format data were received in. In both of those cases, the patrons were able to quickly and easily correct the format problems. A more detailed review of the surveys is included in Appendix A. Distribution of the survey questionnaire is a permanent part of filling information requests.

NRIS Strategic Plan

NRIS conducted a strategic planning process during FY93. The process included a revision of the NRIS mission statement; identification of internal and external strengths/opportunities and weaknesses/obstacles; and short term and long term program goals. The plan is viewed as a dynamic document with specific sections examined in more detail and expanded upon. Specifically, the strengths and weaknesses identified will be expanded upon to determine the best methods to maintain the strengths and to mitigate the weaknesses. In addition, a more detailed plan addressing appropriate use of technology in delivering natural resource information is being developed.

USGS Map Distribution

In FY93, NRIS became the state distribution point for new or revised printings of U.S.Geological Survey (USGS) topographic maps. NRIS will receive 100 copies of each newly revised 1:24,000 or 1:100,000 topographic map from the USGS. In turn, we will distribute copies to state agencies requesting them. A survey was conducted to determine which agencies desire maps and how many copies they wish.

1993 Legislative Session

NRIS fared well during the 1993 Legislative Session in terms of its budget. A small increase in Resource Indemnity Trust funding was authorized to cover the pay-plan increase enacted by the 1991 Legislature. At NRIS's request, the program's Legislative Contract Authority (LCA) was restored. This authority must be requested anew each session. NRIS had $650,000 in LCA for the 1993 Biennium and entered into over $720,000 in contracts. As a result, $850,000 of LCA was approved for the 1995 Biennium. In HB2, $200,000 of budget authority was approved in order for NRIS to receive funds from the Montana Department of Transportation (DOT) for DOT's use of the Natural Heritage Program.

Technology Improvements

Fiscal year 1993 was a time for overall improvement in computer capabilities. Two Data General Unix graphics workstations were acquired on loan from the Montana Department of Health and Environmental Sciences Water Quality Bureau. One workstation is used to provide public access to NRIS GIS data and the other acts as a server for the GIS plotter, printer, and digitizer. Arc/Info software licenses were acquired for each new workstation. New PCs were acquired for the GIS Coordinator and the NRIS Director. These new PCs were linked into the GIS local area network and provide ArcView access to the databases. The Water Information Technician was also hooked into the network and can now directly access geographic and water for maps and reports. The Heritage Program also upgraded several of its PCs.

NRIS Staff

Overall, there were few changes in NRIS staff during FY93. Specific staff changes are discussed in the individual program reports. On the following page is the organizational chart for NRIS as of September 1, 1993.

1994 GOALS

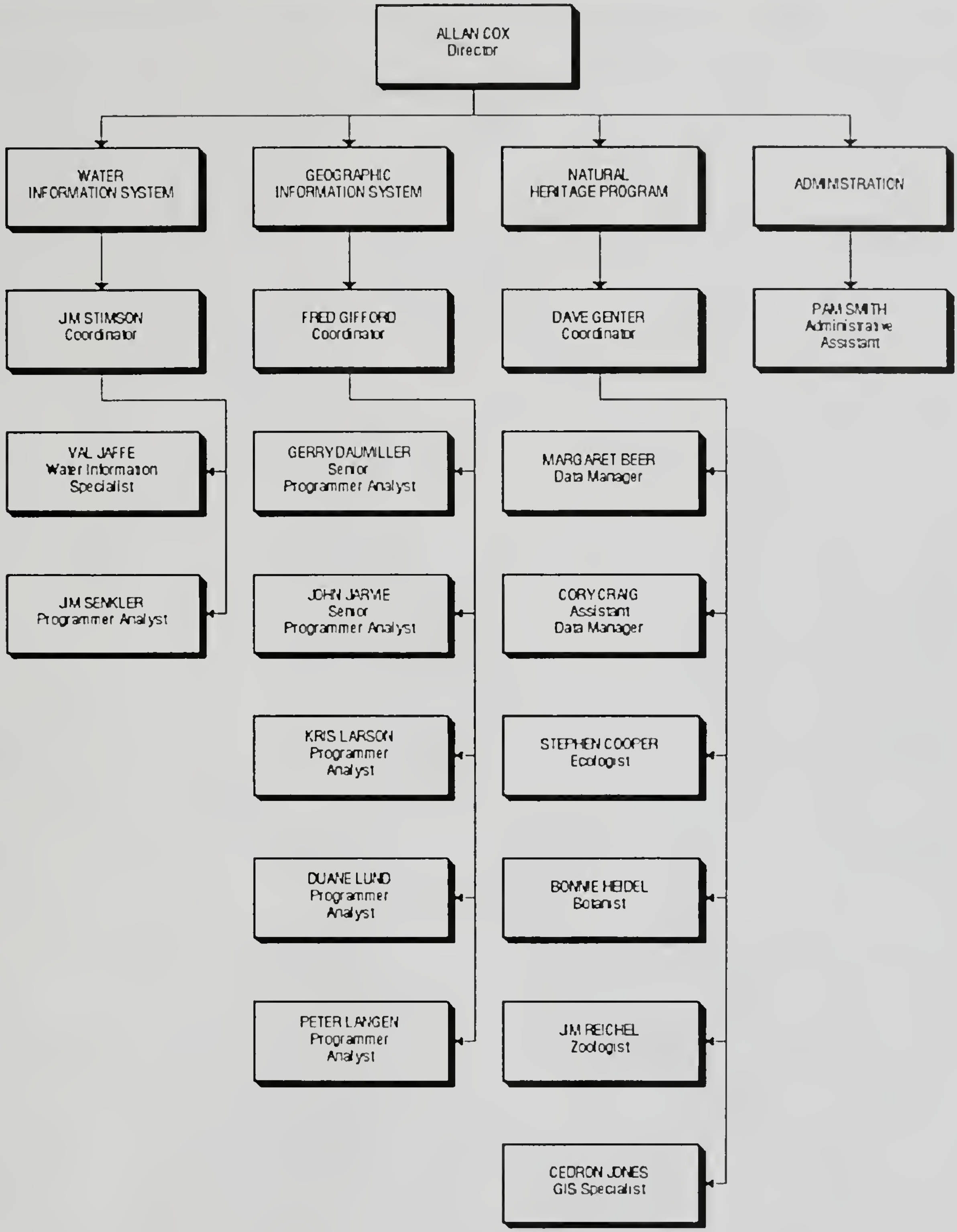
NRIS will continue to support and improve the information delivery services of its Natural Resource Index, Natural Heritage Program, Water Information System, and Geographic Information System.

NRIS will increase its integration of services into the State Library and outreach to the Montana library community. Public, special, school, and research libraries can act as the initial contact for fielding requests for information or for NRIS services. In addition, the public library system can serve as a distribution network for natural resource information. NRIS will continue to plug into this network to increase its effectiveness in serving Montana's citizens.

NRIS will continue to convert its Montana Natural Resource Index to WLN.

NRIS will continue to identify and implement methods to increase access to natural resource information. These methods will include more hands-on systems for the public and more on-line access to NRIS information. Specifically, NRIS has a goal of identifying the most appropriate technologies to more effectively deliver information. In some cases these solutions will be low technology (i.e., phone access, personal contacts, etc.) while in other cases the solutions will be high technology such as Internet access or on-line access to NRIS information.

NRIS plans to continue to expand the installed base of libraries using the ArcView™ GIS interface program. This expansion will involve developing the support necessary to maintain the databases and provide training to the users. ■


ALLAN COX
Director
WATER INFORMATION SYSTEM
GEOGRAPHIC INFORMATION SYSTEM
NATURAL HERITAGE PROGRAM
ADMINISTRATION
JIM STIMSON
Coordinator
FRED GIFFORD
Coordinator
DAVE GENTER
Coordinator
PAM SMITH
Administrative Assistant
VAL JAFFE
Water Information Specialist
JIM SENKLER
Programmer Analyst
GERRY DAUMILLER
Senior Programmer Analyst
JOHN JARVIE
Senior Programmer Analyst
KRIS LARSON
Programmer Analyst
DUANE LUND
Programmer Analyst
PETER LANGEN
Programmer Analyst
MARGARET BEER
Data Manager
CORY CRAIG
Assistant Data Manager
STEPHEN COOPER
Ecologist
BONNIE HEIDEL
Botanist
JIM REICHEL
Zoologist
CEDRON JONES
GIS Specialist

NHP

NATURAL HERITAGE PROGRAM

The Heritage Program continued its participation in significant inventory and research projects during FY 1993. These efforts involved coordination and collaborative efforts with most major federal and state land management agencies, private industry and individuals, and several non-profit groups.

Of particular note is the most heavily-used portion of the Heritage Program's Biological and Conservation Data System (BCD) has been loaded onto the U.S. Forest Service mainframe computer in Missoula. This allows USFS personnel direct access to the information via their Data General terminals. Preliminary statistics show a large increase in use of the data (ca. 77 USFS requests in the first month).

1993 GOALS

Provide ready access to site-specific data on Montana's biological diversity.

This goal remains our top priority for service. Requests continue to increase--an average of 50 per month (not including USFS on-line requests), and the addition of an Assistant Data Manager to the staff has kept turnaround time for most request to less than five days. Many requests involve site-specific or species-specific queries; however, increasingly the program deals with information at the community and landscape level for assessments. Data are also made available frequently to requestors using GIS: point data and attributes are easily exported and converted to a GIS format.

Maintain checklists of Montana vertebrates and high ranked plant species.

These lists underwent substantial revision and review in May, and were widely distributed to public agencies and private organizations and individuals. Changes appearing in the Federal Register were incorporated into these lists, as well as changes in the status and biological rankings for species and communities. These checklists provide the only statewide compilation of the various species rank and status categories available, and have proved to be extremely useful to requestors.

Prepare and maintain a computerized abstract on each vertebrate species in Montana.

The addition of a zoologist to the staff has allowed significant expansion and updates to these abstracts; in particular, records on rare small mammals, reptiles, and amphibians. This data base is used frequently in preparing county or regional species lists for requestors, responding to questions from the general public about common or rare species, and providing essential background information and literature searches that would be time-consuming and impractical to gather from other sources.

Prepare and maintain an updated list of available literature or secondary sources of information.

The Source Abstract data base increased from approximately 4,325 records to over 10,500 in the past year, largely due to the conversion and inclusion of about 5,000 wildlife-related sources from Western Environmental and Technology, Inc. In addition, the Assistant Data Manager, who has a Masters degree in Library Science, has made significant contributions in standardizing citations, refining keywords, and developing additional reporting techniques.

Assist agencies in developing and conducting GIS projects on fish and wildlife.

The Heritage Program continued to provide appropriate information and recommendations on use of biological data in a GIS environment. The Heritage Program GIS Specialist also completed digitizing a coverage of all state Wildlife Management Areas, updated the U.S. Forest Service coverage, and continues to develop and update a coverage of private lands under special protection in Montana. This information has been particularly useful for the U.S. Fish and Wildlife Service Gap Analysis project and the Interagency Natural Areas Committee.

1993 ACCOMPLISHMENTS

Data Responses

Over 600 data requests were handled in FY 1993, with about 40% of these requests coming from state agencies. This compares with 448 requests in FY 1992, an increase of about 35%. Response time is under five days for all but the most complex requests. Products provided included: bibliographies, printouts of sensitive species location records, GIS maps showing sensitive species distribution, vertebrate species lists for specific areas, copies of technical reports prepared by Heritage staff, and miscellaneous lists, reprints and technical support.

Montana Interagency Natural Areas Committee

The Heritage Program continues to provide technical service and data management for coordinated statewide natural areas activities. Final modifications to Heritage Program data bases have been made to accommodate interagency natural areas data. Data entry is proceeding at a remote installation of BCD in Missoula as well as the Helena office. Staff members participated in statewide Coordinating Committee meetings, presented papers at general meetings and technical sessions, and helped with overall planning and organization of the annual conference in Lewistown.

Staff Changes

Stephen V. Cooper accepted the position of Community Ecologist and began work in June. Deborah Richie was hired to fill a U.S. Forest Service cooperative position in the Watchable Wildlife Program. This position is based in Missoula. In addition, several volunteers have been recruited and trained to assist with a statewide vertebrate distribution project, updating records of bird sightings as part of the publication *Montana Bird Distribution*, and to assist with computerizing the data request log.

Participation in Species Recovery Groups

David Genter continued participation in the Arctic Grayling Working Group, which has produced a draft recovery plan for the species. Additional collaboration with the Montana Department of Fish, Wildlife and Parks, U.S. Forest Service, U.S. Fish & Wildlife Service and American Fisheries Society is ongoing for several fish species of special concern. Jim Reichel and David Genter are in the initial stages of planning conservation strategies for several sensitive species in collaboration with state and federal biologists. These include the harlequin duck, northern bog lemming, and Coeur d'Alene salamander.

ZOOLOGY: Research, Monitoring, and Inventory on Rare Animals

Projects include surveys and reports on the following:

- In cooperation with the Gallatin National Forest, Boreal and flammulated owl surveys on the Gallatin National Forest.

- Ongoing harlequin duck surveys in the Flathead River basin.

- Harlequin duck surveys and monitoring in the Clark Fork River basin.

- Status report of harlequin ducks in North America, prepared by the Harlequin Duck Working Group (interagency cooperators from Canada, Montana, Wyoming, Idaho, Oregon, Washington, Alaska and Maine).

- Surveys and status report on the northern bog lemming in Western Montana.

- Surveys on bat species in western Montana resulting in four reports on species occurrence, habitat use and ecology.

- A project to survey, document status and distribution of aquatic bivalves in the Columbia River drainage of western Montana was initiated. This two-year effort involves collaboration with the U.S. Forest Service, University of Montana and Montana State University, and the Montana Department of Fish, Wildlife, and Parks.

- Completion of the second year of sculpin surveys in northwest Montana. Report completed and submitted to the U.S. Forest Service and Montana Department of Fish, Wildlife, and Parks. Emphasis was on distribution, habitat use and relative population status for rare species. Genetic studies through the University of Montana Wild Trout and Salmon laboratory have been initiated.

- Completion of a landscape-level assessment on threatened, endangered and sensitive species for the Elkhorn and Big Belt Mountains--a joint effort with the Helena National Forest.

- Bird banding efforts continued, with 85 harlequin ducks banded in northwest Montana, and over 850 American white pelicans banded at two colonies (Canyon Ferry Wildlife Management Area and Arod Lakes).

Efforts also got underway for the production of a book on the amphibians and reptiles of Montana in a cooperative project with the Montana Department of Fish, Wildlife, and Parks.

Data on bird distribution in Montana continue to be submitted to the Heritage Program and processed by staff. These data will form the basis for the fifth edition of *Montana Bird Distribution.*

Several presentations at professional meetings were made by D. Genter and J. Reichel. This included one paper submitted to the Montana Academy of Sciences on biodiversity in Montana, and a lay article published in *Montana Outdoors* on harlequin ducks. Extensive coverage of the Heritage Program's work on harlequin ducks is to be featured in the November, 1993 issue of *National Geographic*.

Heritage staff continue to work with Gap Analysis to develop species habitat models. This project has necessitated collaboration with state, federal and university biologists and managers.

BOTANY: Research, Monitoring and Inventory of Rare Plants

Projects included surveys and reports on the following taxa:

- Allotropa virgata - status review update on Bitterroot and Deerlodge National Forests

- Big Belt and Elkhorn Mountains sensitive plant survey - U.S. Forest Service (USFS)

- Arabis fecunda - demographic monitoring, report to U.S.Fish and Wildlife Service (USFWS), USFS

- Cirsium longistylum - demographic monitoring and taxonomic research - USFWS

- Lesquerella spp. novum - survey - U.S. Bureau of Land Management (BLM)

- Cypripedium calceolus - survey - BLM

- Quercus macrocarpa - survey - BLM

- Highland Mountains sensitive plant survey - USFS

- Shosonea pulvinata - demographic monitoring - BLM

- Astragalus scaphoides - demographic monitoring - BLM

- Penstemon lemhiensis - demographic monitoring, reports to BLM, USFS

- Erigeron lackschewitzii - survey and taxonomic research - USFS

- Ranunculus jovis - survey - USFS

- Chrysothamnus parryi spp. montanus - survey - USFS

- Initiation of 21 new field studies in 1993 field season.

COMMUNITY ECOLOGY

NHP initiated four Challenge-Cost-Share Projects with the U.S. Bureau of Land Management to be completed in the spring of 1993, of which three have been extended due to an extended vacancy of the ecologist position. These projects include:

- Development of comprehensive lists and rarity ranks of vegetation types on BLM lands in Montana;

- Development of a vegetation type classification for selected BLM lands in Beaverhead, Granite, Silver Bow, and Madison counties;

- Development of a vegetation type classification for all BLM lands in east central Montana;

- Completion of a vegetation type classification for selected BLM lands in the southern portion of the Pryor Mountains.

The Natural Heritage Program community ecologist also:

- Drafted (with Peter Lesica) a paper on the alpine vegetation of southwestern Montana to be submitted as a Forest Service Research Paper and to appropriate journal.

- Continued refining NHP's comprehensive list of vegetation types for the state and their individual rarity ranks.

- Sampled the proposed BLM Area of Critical Environmental Concern (ACEC), Bitter Creek, establishing 55 plots; preliminary analysis indicates several new community types.

- Sampled the BLM holdings on Saddle Butte and vicinity for conservation potential and to ascertain the existence of putative rare community types.

- Assisted botanist with vegetation sampling at several bog lemming sites on the Beaverhead National Forest.

1994 GOALS

We anticipate that the number of information requests will continue to increase and that our service will continue to be of the highest quality. We hope to fully-integrate GIS capabilities into the daily workings of the program in the upcoming year, using this technology for both direct data management and for data responses. Our greatest challenge will be to provide quality service to an ever-increasing number of requestors, and still devote necessary time and effort to data base growth and information acquisition.

Greater awareness and access to information and databases managed by NHP will be a priority for the coming year, with the primary target being increased service to state agencies.

With the addition of a staff zoologist, we anticipate increased project activity and consultation on rare animals. This will be particularly helpful to agencies that require specific information or expertise in assessing development impacts and preparing recovery plans.

Integration of various data into site-based records has long been a goal. We will pursue this through efforts with the Interagency Natural Areas Committee and continuing our conservation planning meetings with state and federal agencies.

We will continue with the Heritage intern program for early career students (Carroll College) in the sciences. We also plan to secure and develop necessary administrative support for the program.

The Heritage Program will also evaluate the feasibility of developing and producing a status report on the state's biodiversity, in conjunction with state and federal partners.

Collaborative efforts in community ecology will be established between The Nature Conservancy and the U.S. Forest Service to allow us to work directly on large-scale applications and regional planning.

We also see continued growth and collaboration with the Montana Department of Transportation, Montana Department of State Lands, and Montana Department of Fish, Wildlife and Parks. These relations will continue to mature with increased exchange of technical information, consultation and cooperative projects. Noteworthy efforts already underway include: assistance to Department of State Lands staff for appropriate inventory and monitoring strategies related to mining projects; the identification of biological resources in wetland environments for Department of Transportation mitigation efforts; and technical assistance to Department of Fish, Wildlife, and Parks division managers for developing noxious weed strategies. ■

WIS

WATER INFORMATION SYSTEM

The Water Information System continues to be the central access point for data from a wide variety of dispersed sources. The number of data sources accessed continued to expand during Fiscal Year 1993 to meet the needs of individual patrons and state agencies. Significant progress continues in utilizing GIS technology to support Water Information activities and the State's Drought Monitoring System. GIS software and map products produced under this effort serve a wide range of data interests and will be made available to other agencies that can benefit from them. In addition to the data clearinghouse activities, Water Information staff provide regular updates and input to several key legislative and agency-level advisory committees that establish statewide water policy. Through all of its activities, the Water Information System is fulfilling the original mandate to make all types of water information more readily accessible and improve data management activities on a statewide basis. Specific Water Information System 1993 goals, accomplishments, and 1994 goals are presented below.

1993 GOALS

Maintain and refine the Water Information clearinghouse services.

Since the inception of the Water Information System, the primary goal has been to identify the most appropriate sources of information and provide efficient and timely access to any person requesting information. A second related goal is to provide the information to the user in a ready-to-use format. This service includes water information presented in tabular and graphical formats. Both goals are addressed on a daily basis with every data request. Efforts to find new data sources and provide access are on-going.

Support statewide efforts to share data and coordinate data collection activities.

The establishment of the Water Information System created a central contact point in Montana for the exchange of water resource data and related information. Water Information staff are routinely contacted by state, federal, and private organizations as a first step in planning new efforts and to determine the best way to distribute information generated by a planned project.

Participate in the design and development of uniform, easy to use software that makes data on Montana's natural resources more readily accessible and usable.

Many times important water resources information exists but in a format that is difficult to use, or there is no automated way to access and use it. NRIS is often contacted for assistance in instances like this and responds by designing easy-to-use computer software that reformats the information and creates efficient and effective access. Several NRIS software user interfaces are being distributed by state agencies.

Increase use of Geographic Information System (GIS) technology in the Water Information clearinghouse operations.

The Water Information System is committed to using new technology to improve operations and to improve the distribution of water data statewide. Efforts have changed from creating an easy-to-use interface to using several commercial products that have recently become available. The commercial products will require less technical support from NRIS staff and represent a substantial improvement over the previous versions. The purpose for utilizing the new GIS interfaces remains the same: to make the GIS technology available to a wider range of patrons who can benefit from GIS. Statewide drought monitoring efforts are also supported by the NRIS GIS and will benefit from the new GIS software products.

Manage and support the Fish, Wildlife and Parks (FWP) Montana Rivers Information System (MRIS).

MRIS is the only data base that provides information on fisheries, wildlife, recreation, natural and geologic features, and cultural features for more than 3,500 stream reaches in Montana. MRIS is accessed with software designed and produced by NRIS, and has been widely distributed throughout the state.

Coordinate and maintain the statewide Drought Monitoring System.

The Drought Monitoring System was developed in 1992 under a grant from the Water Development Grant program. The Monitoring Program is now incorporated into NRIS as part the overall information management and dissemination effort. NRIS provides monthly drought monitoring maps, and support statistics and graphs, annually from February to August. NRIS will continue to information to serve the Montana Drought Advisory Committee and Montana's citizens.

Brief and advise committees of the Montana Legislature and state agencies on water resource data issues.

Several legislative and agency committees establish statewide policy on important water resource issues. Staff of the Water Information regularly attend meetings and provide special briefings on NRIS, the Water Information component, and data management issues.

1993 ACCOMPLISHMENTS

Data Clearinghouse Activities

Expanded public access to NRIS information was achieved by establishing a public use area within NRIS. Two NRIS computers were set up to serve walk-in public access. The computers can access data bases residing on compact disks (CD) products and remote on-line sources, such as the U.S. Geological Survey's (USGS) WATSTORE database. Access to GIS water data was also enhanced by the establishment of a public use GIS workstation in the Montana State Library. Water Information staff have dedicated a substantial amount of time assisting the general public and government agency personnel in learning to use the public access computers. While not every data user prefers to process their own data request, the public access option has been received positively.

Public access was also improved by placing water information on the State Bulletin Board System (BBS). The State's BBS is accessed by users throughout Montana and from other states. NRIS has placed streamflow and drought information on the BBS. Updates are provided on a monthly basis.

The number of data sources accessed by NRIS increased again for FY 1993. Eight new U.S. Environmental Agency (EPA) data systems were added to address the need for information on non-point source water pollution prevention and mitigation. Access and services from other NRIS sources were refined and improved to accommodate user needs.

GIS coverages showing the distribution of various types of water information were updated and made available on the NRIS GIS. These coverages are used by Water Information staff as quick references to locate data sources for individual requests. Coverages include Montana Bureau of Mines and Geology (MBMG) well locations and water quality sample sites; U.S. Geological Survey (USGS) well sites, stream gaging stations, and all water quality collection sites; all EPA water data sites; U.S. Soil Conservation Service (SCS) climate stations, snow monitoring sites, and precipitation sites; NOAA climate stations; and data sites available from the Western Regional Climate Center.

Improvements were made to drought monitoring data files from SCS and the Montana Climate Center at Montana State University. The modification facilitates easy importation into the NRIS GIS and streamlines the process of creating drought maps.

NRIS is maintaining subscriptions to five EarthInfo, Inc. Compact Disks that provide climate and streamflow data for the U. S. and Canada. These products provide important supplemental access to USGS and National Weather Service data, and permit the download of large volumes of data quickly.

NRIS updated the software used to develop user interface and data base reporting programs. This new version facilitates creation of more sophisticated programs, increases software performance, and reduces development time.

Several new commercial software products were purchased by the Water Information System to assist reformatting tabular and graphic data files. Like other software in the Water Information System, these programs are used to make it easier to use water information. Reformatting data retrieved from various sources is one of the primary activities under the clearinghouse service.

NRIS is working closely with the state and federal agencies that are primary sources of hydrologic and climatic data for Montana. Our efforts focused on improving access and coordination in responding to information requests. There has been significant progress made in this area with the U. S. Geological Survey U. S. Soil Conservation Service, Montana Bureau of Mines and Geology and the Montana Climate Center.

Initial training for Val Jaffe, the Water Information Specialist hired in March 1992, was completed. Ms. Jaffe is NRIS's lead contact on all information requests and conducts all data transfers, reformatting, and map production for the Drought Monitoring System. Training continues on using the GIS to support Water Information tasks.

NRIS completed the U. S. Geological Survey NAWDEX project, to create a PC version of the USGS Master Water Data Index (MWDI). The USGS is now distributing the MWDI to its service centers in fifty states. Initial talks have been conducted on additional programming tasks.

Montana Rivers Information System Management for Fish, Wildlife, and Parks

The Montana Rivers Information System (MRIS) remains one of the most intensively used data systems available through NRIS. One of the main goals for the MRIS project is to update the system with new data in Fiscal Years 94-95. NRIS completed edit/entry software that allows FWP regional biologist to enter new data and compare the new information with old data. The edit/entry system is being used to update the FWP Streams data base. Support was provided to the FWP MRIS project director and staff in updating the FWP Streams data base which will be used to update the MRIS.

Work to redesign the MRIS user interface was initiated. The new MRIS interface will incorporate major changes and features developed for the USGS MWDI. The MRIS has also been changed to utilize the EPA River Reach Numbering System to locate information on fisheries, wildlife, recreation, natural and biological resources for 3,500 stream segments in Montana.

Five copies of the MRIS were installed in locations around the state. While most users request NRIS staff to process requests from the MRIS, the System is designed to function as a stand-alone data base, and is easy to operate. NRIS provides ongoing support for individuals and agencies that use the MRIS in-house.

Montana Drought Monitoring System

Modifications and refinements were made to the drought maps, support statistics and graphs, data transfer procedures, and data file formats. Map products were changed to make interpretation easier and statistics and graphics were added to the suite of products delivered monthly to the Drought Advisory Committee. The Committee responded very positively to changes in the map products and continues to rely on the map products as a primary source of information on statewide moisture conditions. See example drought maps at the end of this section.

GIS software used to generate the drought maps has been refined to be menu driven. Simplifying and automating the map production procedures helps reduce the time and cost of producing the maps.

An alternative means of accessing drought maps was created for the public by utilizing one of the new GIS software products, ArcView~. ArcView~ make it possible to view GIS data coverages, create simple data queries, and conduct rudimentary spatial analysis. NRIS, and the Montana State Library are distributing ArcView~ software to libraries around the state. NRIS provides statewide data coverages with the software, including drought information. Current, and 1992, drought maps are made available. Access was also facilitated through the public access workstation in the Montana State Library.

Drought information was also placed on the State's BBS for access by the public and other interested parties. Monthly streamflow data, Surface Water Supply Index (SWSI) values, and Palmer Drought Severity Index (PDSI) data are placed on the BBS.

Initial plans to place bitmapped images of the two drought maps and charts have been completed. Under this effort, images of the SWSI and PDSI maps would be uploaded to the

BBS. Patrons using Microsoft Windows software on their home computers could download and view the drought maps. For users without Windows software, a public domain software product for viewing images would be made available for downloading and use. In this way the actual drought maps could be disseminated to the news media and the general public.

Statewide Coordination

The Water Information Coordinator provided briefings to several working groups and the Advisory Committee of the Montana State Water Plan. The Plan examined water quantity and quality issues for ground water and surface water in Montana. There were several plan components dealing with data management and dissemination. By having input to and coordinating with the Water Planning process, NRIS makes a direct contribution to the establishment of statewide policies on important water resource issues.

Special briefings were also given to the Legislative Water Policy Committee and the Environmental Quality Council concerning the Water Information System and the new Drought Monitoring System. Both committees have strongly supported and endorsed the NRIS program and its leadership role in Drought Monitoring, and have requested regular updates to track NRIS's progress.

The Water Information Coordinator continues to chair the Montana Ground Water Assessment Steering Committee and was named as a member of the State's Water Resources Coordination Committee (WRCC). These committees consist of members from all of the State and federal agencies that have responsibilities to manage Montana's water resource. By participating in these committee activities, the NRIS is helping facilitate information sharing and coordination among water resource agencies.

Software Design

Testing of two new GIS interface software products has been initiated. The products, developed by ESRI, Inc., will be updated periodically. The products make it easier for Water Information staff to use the GIS for routine tasks. As experience is gained, GIS products will be used more frequently to help fulfill information requests.

Work on the USGS Master Water Data Index, or NAWDEX, project was completed. USGS personnel were pleased with the final product which is being distributed to USGS offices in each state. Many of the search functions, user support features, and general programming routines developed for the MWDI interface will now be integrated into other NRIS software products like the Montana Rivers Information System, Montana Data Directory, NRIS Request Log, and the NRIS Well Log Data Base.

Discussions with MBMG staff concerning the update and modification of the Well Log user interface were initiated. Plans include the incorporation of improvements developed under the USGS MWDI project and making additional data fields available for reports.

Significant progress on the Ground Water Atlas project was achieved. Ground water and geologic GIS layers and data from the MBMG was imported into the NRIS GIS. Information on public drinking water supplies and underground fuel tanks was received from the Department of Health and Environmental Sciences (DHES) and imported to create additional GIS map layers. Drafts of the coverages were produced for review by EPA, DHES, and NRIS personnel. All coverages can be viewed using the public access GIS workstation at the Montana State Library.

The Water Information component of NRIS helped send John Jarvie, one of the NRIS GIS programmers, to the Geographic Information Systems and Water Resources Conference sponsored by the American Water Resources Association (AWRA). Jarvie attended presentations showing how the GIS technology is being applied to surface and ground water issues nationwide. Jarvie has used several of the techniques discussed at the Conference to produce new map products for the Drought Monitoring System and the Ground Water Atlas.

1994 GOALS

Continue to operate and refine the Water Information System and the data clearinghouse services.

Continue to promote and support statewide efforts to share data and coordinate data collection activities.

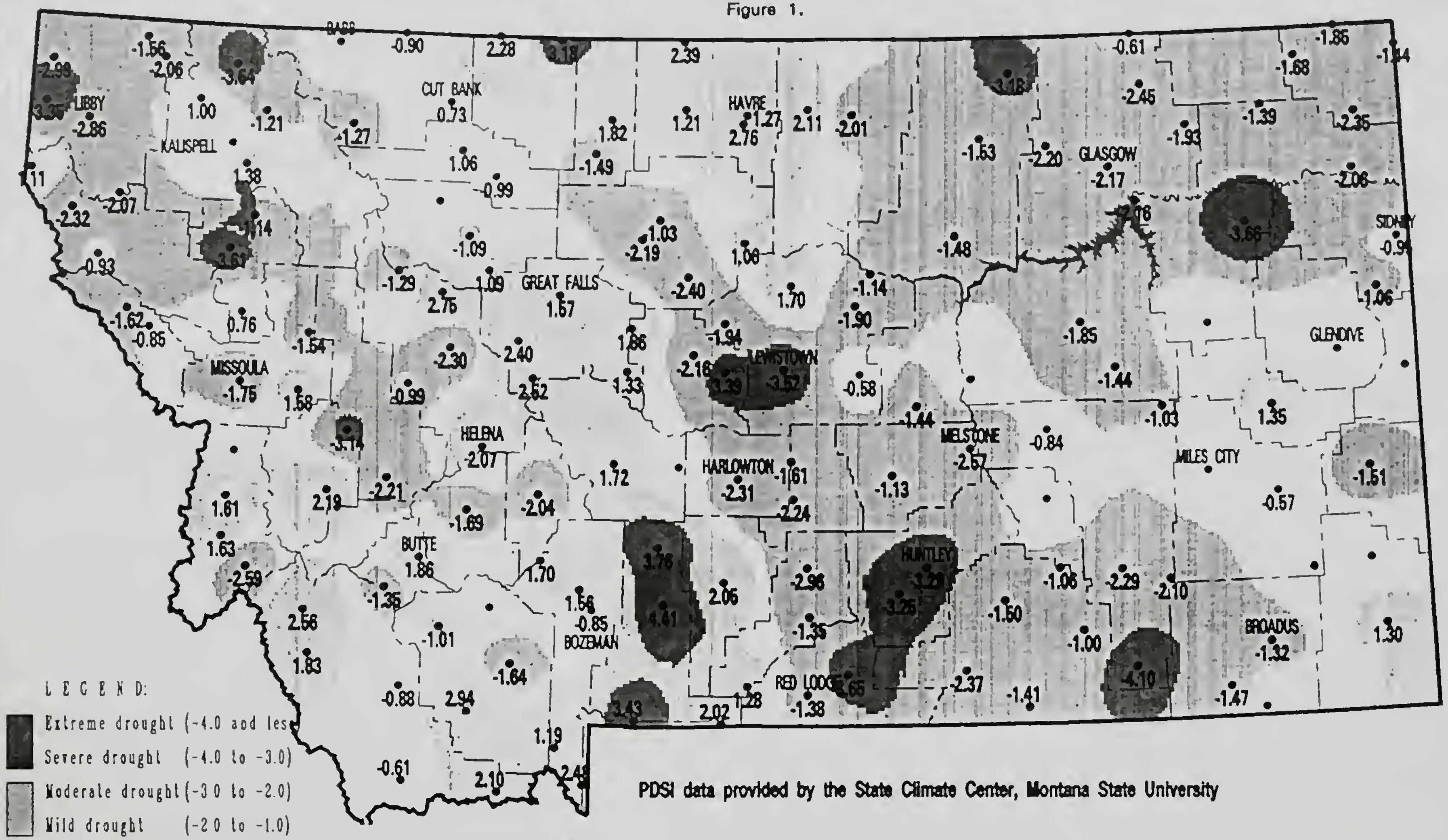
Refine data base software products developed at NRIS and design new products for other types of natural resources data.

Expand the use the NRIS GIS to support the Water Information activities and to serve a wider range of users who can benefit from the GIS technology.

Complete the update of the Montana Rivers Information System (MRIS) and redesign the System's user interface.

Maintain the Drought Monitoring System as part of NRIS's overall program of information management and dissemination. Seek additional funding sources to assist with the operation of the System, to develop new drought map products, and to increase the availability of the map products statewide. ■

Figure 1.



L E G E N D:

▓	Extreme drought (-4.0 and less)
▓	Severe drought (-4.0 to -3.0)
▒	Moderate drought (-3.0 to -2.0)
▒	Mild drought (-2.0 to -1.0)
☐	Incipient drought (-1.0 to -0.5)
☐	Normal (-0.5 to 0.5)
☐	Incipiently moist (0.5 to 1.0)
☐	Moist (1.0 to 2.0)
░	Unusually moist (2.0 to 3.0)
▓	Very moist (3.0 to 4.0)
▓	Extremely moist (4.0 and greater)

PDSI data provided by the State Climate Center, Montana State University

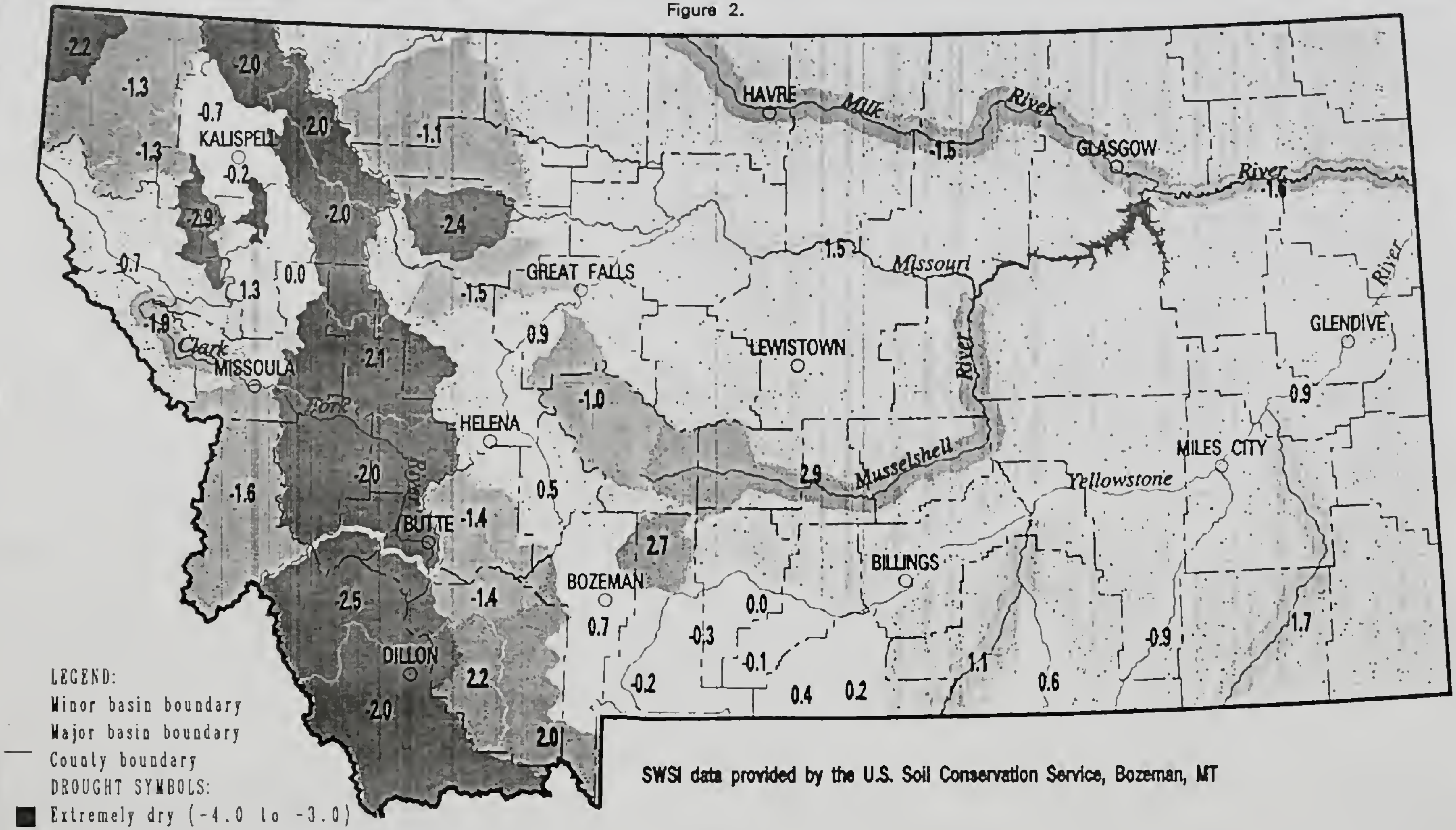
Palmer Drought Severity Index (PDSI) Values:

July 1, 1993

NOTE: PDSI values primarily indicate moisture conditions on non-irrigated prairie lands. The values shown may be based on provisional data and subject to change. Points on the map without a PDSI value are in the normal range (-0.5 to 0.5).

Natural Resource Information System
Montana State Library

Figure 2.



SWSI data provided by the U.S. Soil Conservation Service, Bozeman, MT

LEGEND:
Minor basin boundary
Major basin boundary
County boundary
DROUGHT SYMBOLS:

- ■ Extremely dry (-4.0 to -3.0)
- ■ Moderately dry (-3.0 to -2.0)
- ▨ Slightly dry (-2.0 to -1.0)
- ☐ Near average (-1.0 to 1.0)
- ☐ Slightly wet (1.0 to 2.0)
- ▨ Moderately wet (2.0 to 3.0)
- ■ Extremely wet (3.0 to 4.0)
- ⊡ No data available or SWSI not applicable

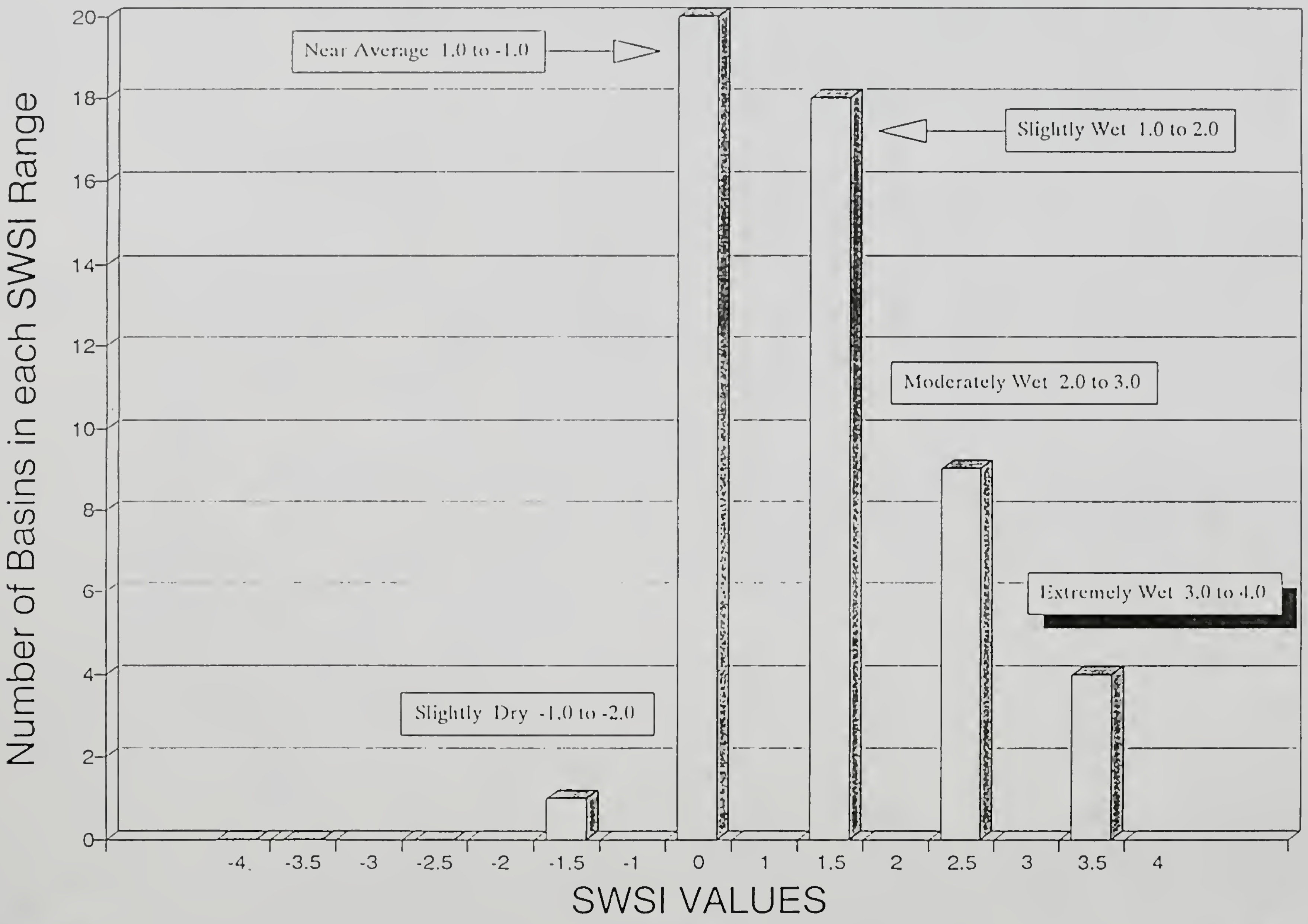
Surface Water Supply Index (SWSI) Values:

July 1, 1993

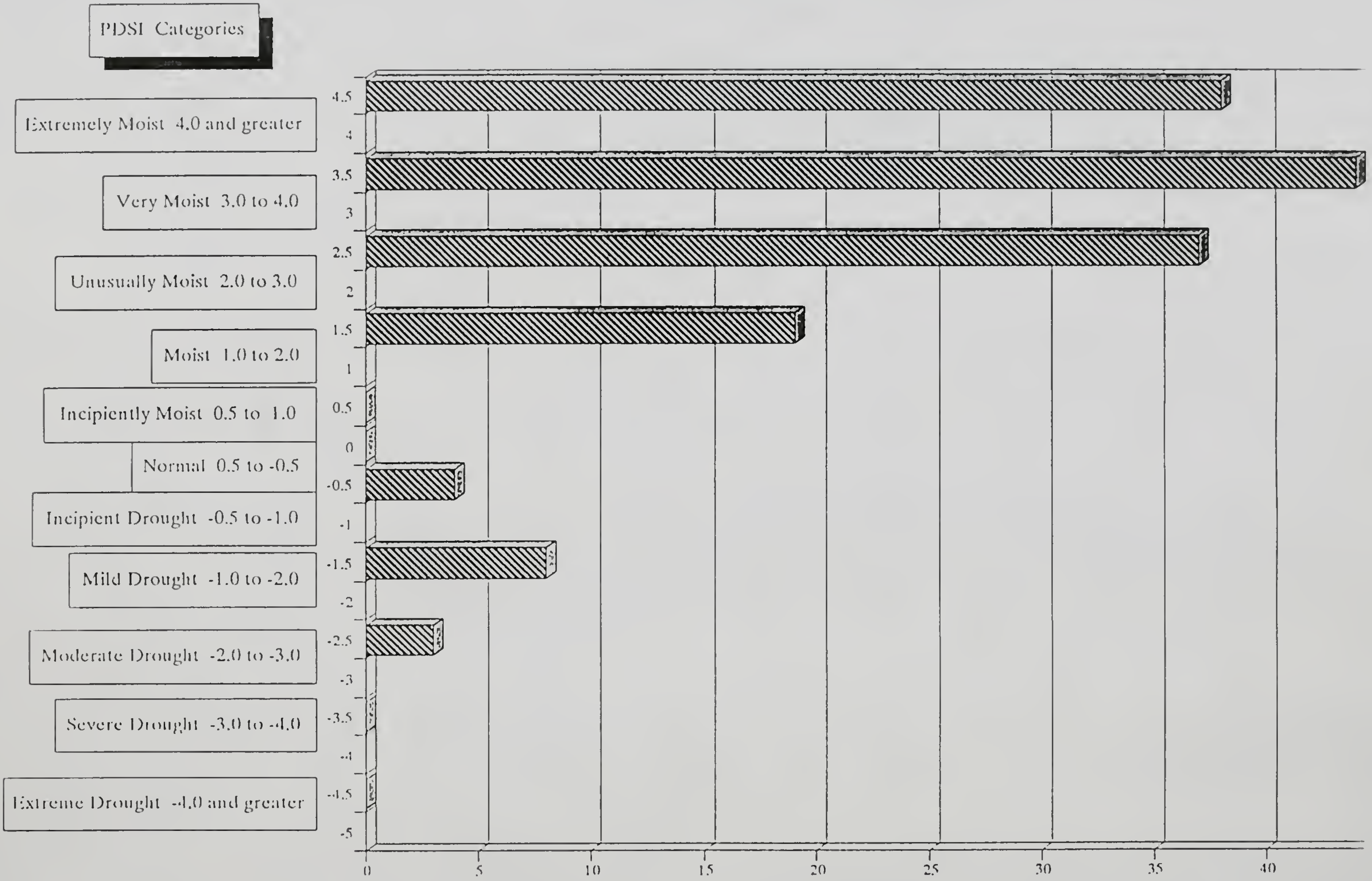
NOTE: SWSI values primarily indicate water supply conditions for irrigated lands within each basin. The values shown may be based on provisional data and subject to change.

NRIS Natural Resource Information System Montana State Library

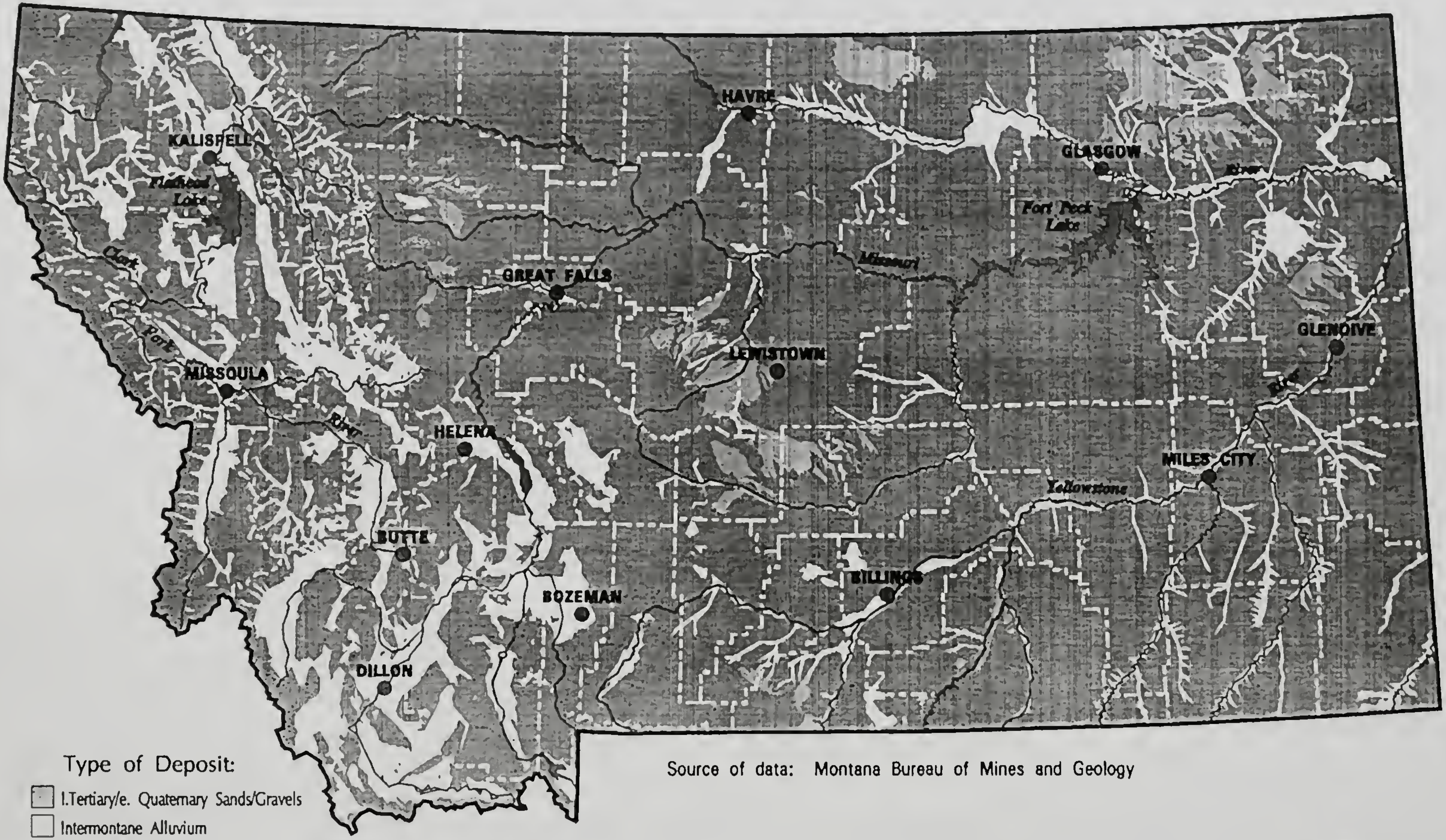
Surface Water Supply Index (SWSI) for August 01, 1993



PDSI DATA: August 01, 1993



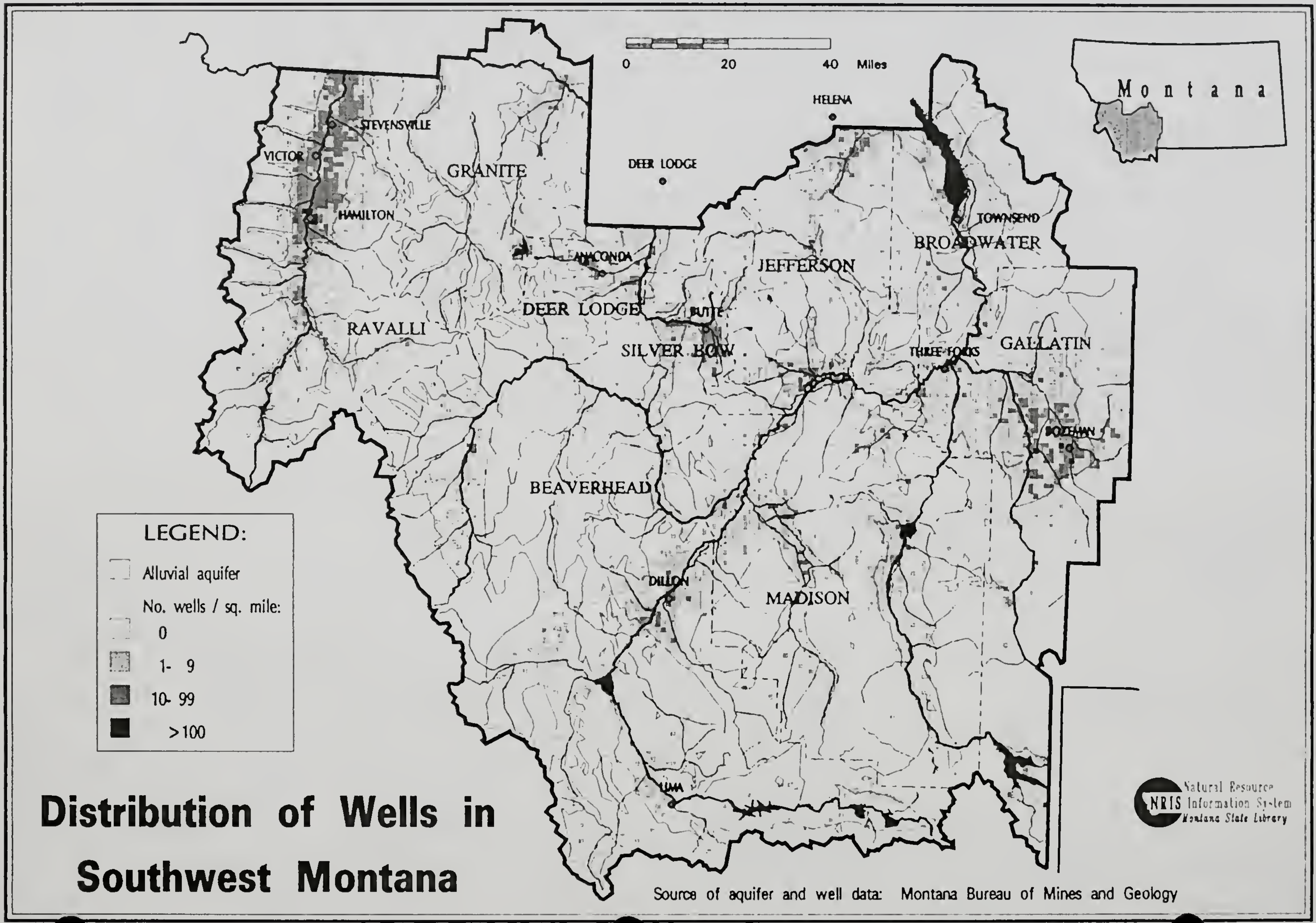
Alluvial Aquifers and Gravel Deposits



Source of data: Montana Bureau of Mines and Geology

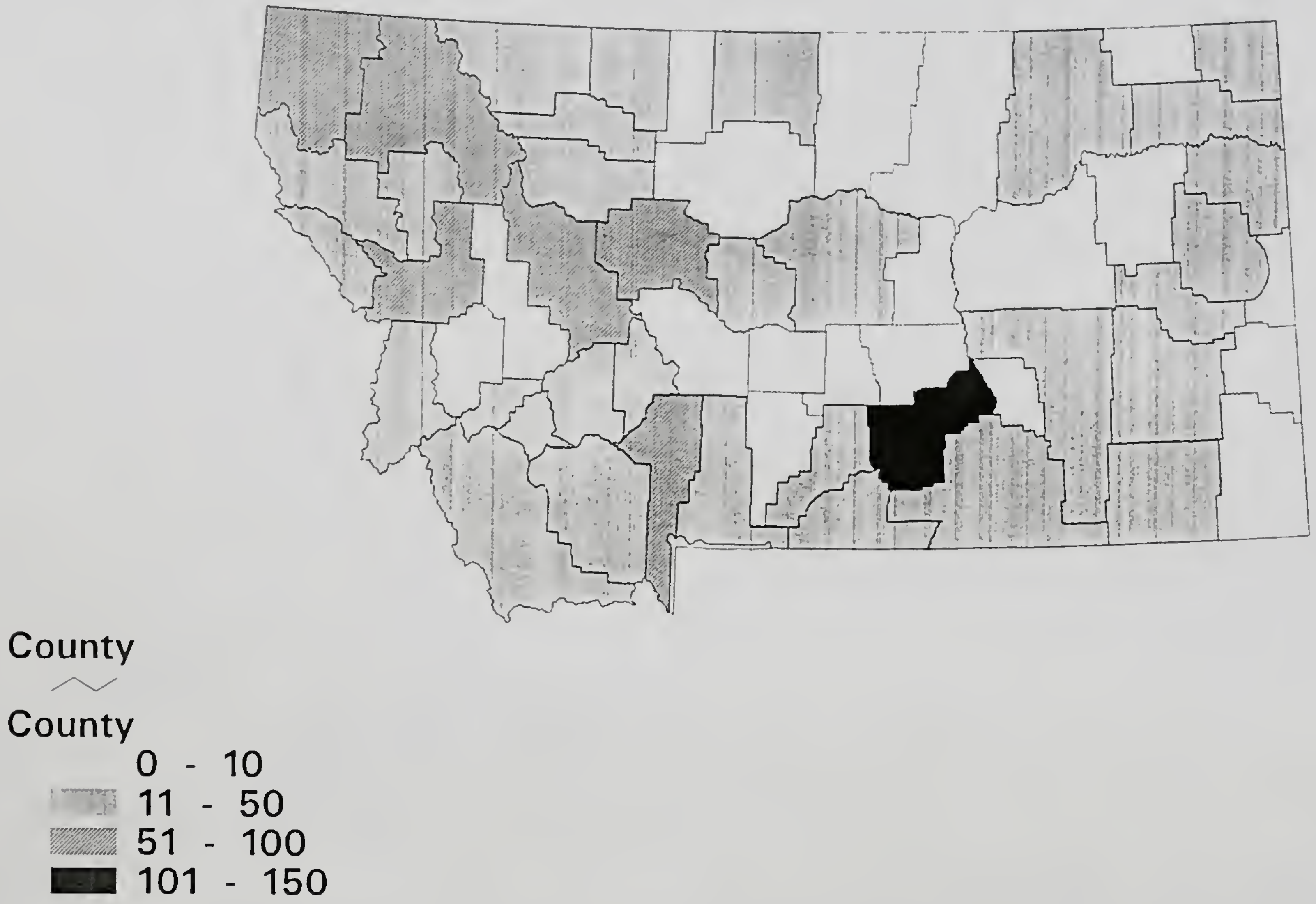
NRIS Natural Resource Information System Montana State Library

Distribution of Wells in Southwest Montana



Source of aquifer and well data: Montana Bureau of Mines and Geology

Number of Leaking Underground Storage Tanks per County



Summer of 1993

GIS

GEOGRAPHIC INFORMATION SYSTEM

During fiscal year 1993 the GIS continued to expand the products and services offered to a growing number of clients. Utilization of GIS by scientists, managers, and other parties interested in activities with geographic components is becoming routine. As the GIS user group grows, and as the users become more sophisticated, the GIS program finds itself under increasing demand, and continually challenged, to provide data and services to its expanding client base.

Fiscal year 1993 saw a great increase in the number of requests for GIS data and the amount of data requested. As GIS is integrated into more organizations operations we expect this trend to continue. We also noted a significant increase in the number of users interested in accessing GIS on their own. This increase is partly due to various out reach efforts by NRIS, partly to the availability of new inexpensive tools for accessing GIS data, and partly to an increased level of comfort with computer technology among the general population.

1993 GOALS

Provide technical assistance to Montana GIS users.

The primary service NRIS GIS performs is providing technical assistance to GIS users across the state. The GIS staff's high level of technical expertise is our greatest asset and, as such, we try to make it available to as many GIS users as possible.

Provide GIS production services.

Providing the highest quality GIS services possible in a timely manner is an ongoing challenge and goal of the GIS.

Participate and lead in standards development.

Data and system standards are the foundation that GIS in Montana builds on. As a promoter of GIS development in Montana, a major function for the NRIS GIS is the coordination of standards development and use.

Facilitation of resource sharing.

One of the primary missions of the GIS is the facilitation of the shared use of technical, financial, and professional resources applied to GIS. By sharing resources GIS applications can be made available to the most people, in the most professional manner possible, at the least cost.

Promote use of GIS by resource managers, scientists, educators, and the general public.

Another goal of the GIS is to promote the use of GIS technology to facilitate natural resource information dissemination. We feel this goal is best accomplished by taking a proactive stance in making GIS technology available to all sectors of society who have an interest in natural resource information.

Develop and share new and emerging GIS technologies.

The extensive experience of the GIS staff allows us to evaluate new developments in GIS technology so that State users can take advantage of them.

Make public sector GIS data available.

Many public agencies have made significant investments in GIS databases. Publicizing the existence of these databases will maximize their usefulness.

Facilitate opportunities for joint funding of projects to create statewide basemap data.

The expense of GIS databases often preclude their creation when only one organization pays all of the development expense. By coordinating the joint funding of GIS database development, access to GIS applications can be spread to a greater number of organizations.

Promote GIS use through education.

Education is a key factor for the continued growth and development of an emerging technology like GIS. A major function of the NRIS GIS is to facilitate opportunities for GIS users across Montana to learn about basic concepts and new trends in GIS.

1993 ACCOMPLISHMENTS

Services Provided

During FY 1993, the GIS provided a wide range of services. The GIS staff are now fully trained on the new hardware and software installed during the previous year and are working at full efficiency.

The GIS provides many data and services on a non-contractual basis. Any request for data from a governmental agency or a non-profit entity would generally fall into this category. For example, a state agency wanted a report on population within ½, 1, 2, 3, and 4 miles of two locations near Billings and Missoula. We used the 1990 U.S Census Bureau data and the GIS system to generate a report and a map.

NRIS also provides technical support to GIS users. The initial phases of GIS implementation often require the highest level of technical expertise at a time when staff are most inexperienced. The NRIS GIS program assists users in all levels of GIS development to ease this transition period. This year GIS staff assisted the Department of Natural Resources and Conservation and Fish, Wildlife, and Parks install their GIS systems. In the table below is a summary of all GIS services by type of product. The program fulfilled 522 requests for a total of 4832 products. Most of the requests were for maps, but there is a growing and significant number of requests for copies of GIS data layers (1310 layers were supplied to patrons). See Appendix B for the breakdown of requests by agency.

	FY92	FY93
Total Requests	205	522
Maps	448	3325
Reports	12	73
Programs	5	28
Data	212	1310
Other	6	96
Total Products	683	4832

Fiscal Years 1992 and 1993 GIS Services Summary

Montana GIS Users Group

The NRIS GIS plays an active role in the Montana GIS Users Group. The user group is a non-profit consortium of government agencies and business involved with GIS technology. The main activities of the users group are the annual users conference and publication of the *Montana GIS News*.

The *Montana GIS News* is designed to facilitate the transfer of information about GIS data, activities, and projects in Montana. The newsletter is published by NRIS for the Montana GIS User Group. There were three issues published during FY 1993.

The annual Montana GIS User Conference provides an opportunity for individuals interested in GIS to share ideas and experiences. The 1992 Conference in Butte (December 1992) attracted over 300 people. NRIS helped with the conference by providing administrative support, active participation on the planning committees, and project presentations. At the Conference, NRIS hosted a Public Night where members of the local community learned about GIS. Public night was very well attended, especially by the local library community.

Montana Interagency GIS Technical Working Group

The Montana Interagency GIS Technical Working Group (TWG) is a forum for the exchange of information regarding the acquisition of new GIS data, the existence of current GIS data, and information relating to GIS projects. NRIS supports the TWG by providing administrative support and actively participating in meetings and sub-committees. Major accomplishments for the TWG during FY 1993 were implementation of the Montana Spot Archive and facilitating a cooperative project for developing a statewide ownership layer.

The Montana Spot Archive is an agreement between the Montana Interagency GIS Technical Working Group and SPOT Image Corporation forming an archive of SPOT satellite imagery for the State of Montana. This archive will allow participating federal, state, and local government agencies to obtain SPOT imagery at substantially reduced costs.

The statewide ownership project is an effort among state and federal agencies to combine resources in the development of a statewide GIS database of broad classifications of land ownership. The project will create many important data layers for GIS users in Montana. This project is an excellent example of government agencies cooperating to get the greatest benefit possible for their investments in information infrastructure.

State Mapping Advisory Committee

The State Mapping Advisory Committee (SMAC) is charged with developing and submitting the state's cartographic requirements to the National Mapping Program of the U.S. Geological Survey (USGS). In Montana, both state and federal representatives are represented in this process. NRIS coordination activities have helped make the Montana SMAC process more effective in acquiring data from the USGS.

GIS Seminars

For the past three years, the NRIS Program has offered a series of GIS Seminars. The seminars are held once a month throughout the fall, winter, and spring. A GIS expert typically gives an hour long presentation to a wide variety of GIS users from governmental agencies and the private sector. The topics of the seminars range from software specific technical tips and tricks, to general information about topics such as cartography or new GIS projects in the state.

Staff Changes

Peter Langen was hired to fill a new position in the NRIS GIS. Peter is a former NRIS employee who left to take a position at the Reserved Water Rights Compact Commission. Peter works primarily on the Clark Fork Superfund GIS contract and the Fish, Wildlife, and Parks Rivers GIS project.

PROJECTS OVERVIEW

Department of Health and Environmental Services - Clark Fork Superfund Project

During FY 1993, the Clark Fork GIS reached full maturity and experienced more than a 100% increase in all categories of products and services. The primary output provided by the Clark Fork GIS are maps. Some of the maps are simple basemaps depicting various physical features and some are the results of complex analysis that is best illustrated in graphic form. The reports generated varied from listings of existing data to the results of spatial accuracy comparisons between two data themes. The data provided were usually supplied to various contractors who also have GIS capabilities. Following is a summary table of production services supplied to users of the Clark Fork GIS during FY 1992 and FY 1993.

	FY92	FY93
Total Requests	105	223
Maps	268	1880
Reports	4	10
Programs	0	6
Data	55	611
Other	4	13
Total Products	331	2528

Fiscal Years 1992 and 1993 Clark Fork GIS Services Summary

The Clark Fork Technical Working Group (TWG) consists of representatives from various groups interested in the use of data systems to support planning and remediation efforts on the four Superfund National Priority List sites in the Upper Clark Fork Basin. NRIS provides administrative support to the Clark Fork TWG, the GIS Coordinator is the TWG chair, and the NRIS Director is on the TWG Executive Committee. One accomplishment during FY 1993 was the development of the *Clark Fork*

GIS Findings and Recommendations. The report is a planning document created from interviews with users of the CFGIS. The document identified GIS user needs. Another accomplishment during the past year was implementation of a plan for upgrading the coordinate accuracy of analytical data in the Clark Fork Data System.

Department of State Lands Support

During FY 1993, the GIS provided various services in support of the Department of State Lands (DSL) Coal and Uranium Bureau GIS. We continued to supply technical support to the new DSL GIS technician. NRIS staff helped load new releases of operating system (SunOS 4.1.3) and GIS software (Arc/Info 6.0.1) and helped install 16 megabytes of memory chips and a CD-ROM. GIS staff also provided several data sets as requested by DSL staff.

Legislative Council Support

Under an interdepartmental agreement between NRIS and the Legislative Council, the GIS provided technical support services for the Council's GIS legislative redistricting application. Technical assistance included advice on acquisition of data, training, and other technical support. Programming assistance included development of programs to automate the production of maps for legislative council staff. Map production assistance included the development of five different statewide legislative district maps, producing a simplified 3-color version of the statewide district map, and producing color separates of simplified maps for use by the Montana Publications and Graphics Department for printing 500 copies for distribution.

Department of Health and Environmental Services Water Quality Bureau - Nonpoint Source Program

GIS support was provided to the Nonpoint Source Program administered by the State Water Quality Bureau (WQB). This support included identifying assessed streams and assigning assessment results as attribute data in the GIS database. A map was produced displaying the assessed streams in relation to EPA's ecoregions and the assessment results.

Department of Health and Environmental Services Water Quality Bureau - Blackfoot River Support

A coalition formed to facilitate better natural resource management within the Blackfoot basin is investigating the use of GIS to support their efforts. The State Water Quality Bureau is supporting this project and is expecting GIS to play a key role in the resource management decisions. GIS technology has already been applied to the Blackfoot basin through the work done by EPA's Environmental Monitoring Systems Laboratory (EMSL) in Las Vegas, Nevada for the Section 525 project. At the direction of the WQB, NRIS is providing support for further work on the Blackfoot basin by participating in planning meetings and providing technical resources and expertise to Desktop Assistance, a nonprofit group who has contracted with the WQB to demonstrate the utility of GIS for this situation. During FY 1992 and FY 1993, NRIS helped with presentations regarding EMSL's GIS system, provided data for the Blackfoot basin, and helped with planning regarding the use of GIS for the Blackfoot basin.

Department of Health and Environmental Services Water Quality Bureau - Drinking Water and Water Quality Programs

Technical support was provided to help extract, reformat, and download drinking water quality, ambient water quality, and public water supply data stored in Mark IV databases on the State's IBM mainframe computer. GPS data for public water supply wells in the Missoula and Helena areas were imported into GIS and a map of the Missoula area was created. Various available road and stream data were compared with the GPS data. Support was also provided in transferring ambient water quality data to EPA's STORET water quality database.

Department of Health and Environmental Services Water Quality Bureau - Stormwater Project

Data on mineral availability and abandoned mining sites from the U.S. Bureau of Mines and the Montana Department of State Lands was obtained, reformatted, and imported into the NRIS GIS database. These data and the capabilities of GIS were used to identify mining sites with higher stormwater pollution potential (i.e., within ¼ miles of hydrography features). Statewide and regional maps were created to show these mining sites and prototype close-up maps were produced to demonstrate how GIS and digital data could be used in the future on this project.

Department of Health and Environmental Services Water Quality Bureau - Clark Fork Nutrient Source Assessment Project

The analysis portion of the project was completed in October, 1992. The major task for FY93 was the completion and printing of custom maps for the final report written by the Water Quality Bureau (WQB) in the Montana Department of Health and Environmental Sciences. Additional maps were created for use at public meetings to show water quality conditions in the Clark Fork basin. Some of the tools developed throughout this project were presented in a paper on "Data Visualization" at the December, 1992 Montana GIS conference.

Department of Health and Environmental Services Water Quality Bureau - Groundwater Atlas Project

Groundwater and geologic data have been obtained from the Montana Bureau of Mines and Geology and have been imported into the GIS system at NRIS. Prototype maps have been created for inclusion in the proposed Montana Groundwater Atlas. These maps are currently under review. Arcview- and Arctools software products have been investigated for map creation and for providing access to users of groundwater and geologic information.

Montana Drought Monitoring System Project

During FY 1992, a grant was obtained by NRIS to enhance the State's drought reporting process by visualizing drought conditions through the production of maps. During FY 1993 the State's drought reporting process was further enhanced using GIS and digital water information. Maps showing the Surface Water Supply Index and the Palmer Drought Severity Index were again produced monthly for the time period February through August. The maps and drought GIS data were converted to the standard Albers coordinate system used at NRIS to be compatible with other data. The maps showing the Palmer Drought Severity Index were improved by using a contouring algorithm to extrapolate the drought index values from geographic points to geographic areas. The result is a map from which statewide patterns are more quickly seen. A map depicting historical maximum, historical median, historical minimum, and current year streamflows by month at 31 USGS gauging stations was initiated. The streamflow map is updated on an ongoing basis. Poster displays were presented at the December, 1992 Montana GIS conference and at the June, 1993 American Association for the Advancement of Science conference in Missoula.

Department of Natural Resources and Conservation - Energy Division

The NRIS GIS provided services to the Department of Natural Resources and Conservation's (DNRC) Energy Division in an environmental impact statement (EIS) for the rebuild of a power line near Libby, Montana. NRIS and DNRC used digital topographic data and GIS tools to examine viewsheds of various power line pole placement alternatives. This project included acquiring and developing several data sets and producing various map products.

Washington State Energy Office/Bonneville Power Administration Project

Maps of thermal power generation sites in the northwest states were created for the Washington State Energy Office (WSEO). Separate maps were done for Washington, Oregon, Idaho, and Montana. The GIS data needs survey was updated. The survey indicates the availability and need for mapping data necessary for regional planning efforts and for the Montana Department of Natural Resources and Conservation to effectively evaluate proposals for additional electrical generation/transmission capacity. Technical support and training sessions were provided to DNRC and FWP to help install and use their GIS hardware and software. NRIS staff also conducted GIS training classes for DNRC staff.

Natural Resource Damage Claim

The NRIS GIS provided various GIS services under contract to the Natural Resource Damage Claim (NRDC) in the Montana Department of Health and Environmental Sciences during FY 1993. NRIS GIS staff created 48 maps and plotted 592 copies of those other maps. NRIS staff also digitized 6 new data layers including sample sites, tailings areas from aerial photos, and well locations. One hundred fifty six data layers were sent to NRDC contractors.

Helena National Forest Project

Under contract, NRIS is providing GIS technical assistance and map production services to the Helena National Forest. The project involves loading raw data supplied by Helena National

Forest into the GIS and processing it for use in riparian studies, environmental impact studies, fire management, wildlife management, and others. Products delivered under this project include maps depicting various types of analysis and tabular reports quantifying the results of spatial analysis.

1994 GOALS

The future holds many challenges for the NRIS GIS. Like most government organizations, we are required to provide an increasing level of services with decreasing resources. We will strive to use our human and technical resources in efficient and creative ways to meet new challenges.

NRIS plans to continue to develop its geographic information system capabilities and databases. Specifically, we plan to link into the state computer network to facilitate electronic data transfers with other state agencies and universities, as well as to provide on-line access to the NRIS system.

The high cost of entry into GIS technology continues to be the largest obstacle to its utilization. We will try to leverage the resources of NRIS so that as many GIS users in Montana as possible can take advantage of existing data, equipment, and knowledge. This goal will be accomplished though outreach efforts to publicize the resources that are currently available.

Data and system standards are a key element in the successful integration of GIS into natural resources management for Montana. NRIS will continue to actively promote standards in all appropriate areas of GIS. Furthermore, we will work to insure that standards previously adopted are adhered to.

GIS is an enabling technology that allows the integration of data sets that have not been viewed as being related. Therefore, we feel it is important to integrate data that have not traditionally been thought of as natural resource information into the GIS. This integration will allow natural resource information to be analyzed in the context of all activities that influence it.

As part of the Montana State Library, we must be advocates for access to GIS information. NRIS will continue to stay at the forefront of data access issues so that all parties interested in GIS data will have equal access.

NRIS has a specific goal for the next biennium to work with the Department of Administration's Information Services Division to develop a mechanism to provide GIS developmental and technical assistance services to state agencies. ■

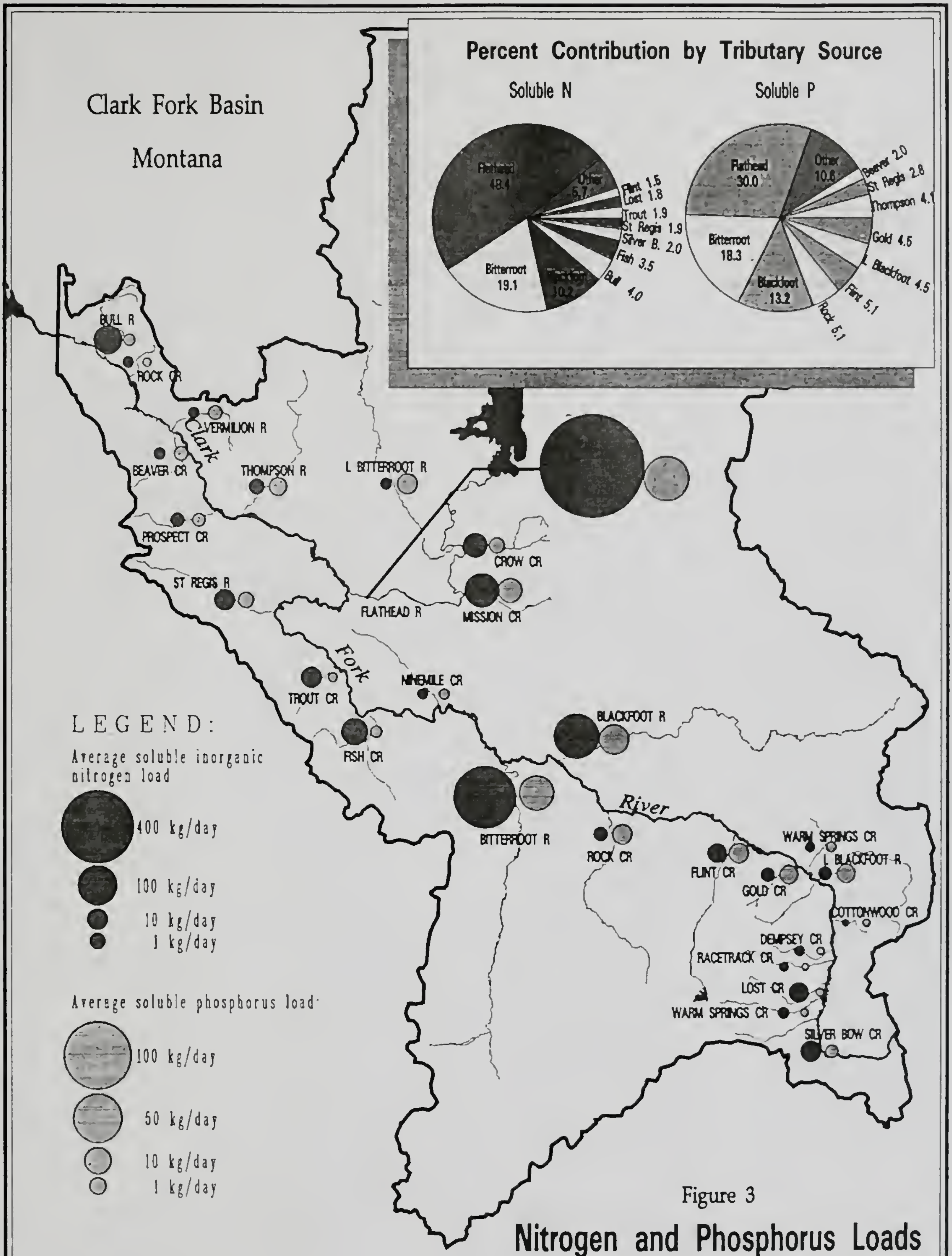


Figure 3

Nitrogen and Phosphorus Loads from Tributary Sources

NRIS Natural Resource Information System
Montana State Library

Work request: 92-WQB-6 June, 1992

1992 Archaeological Survey: Cherry Creek Study Unit

Archaeological Sites

State of Montana
NRIS

Work request 93-NRIS-173 April, 1993

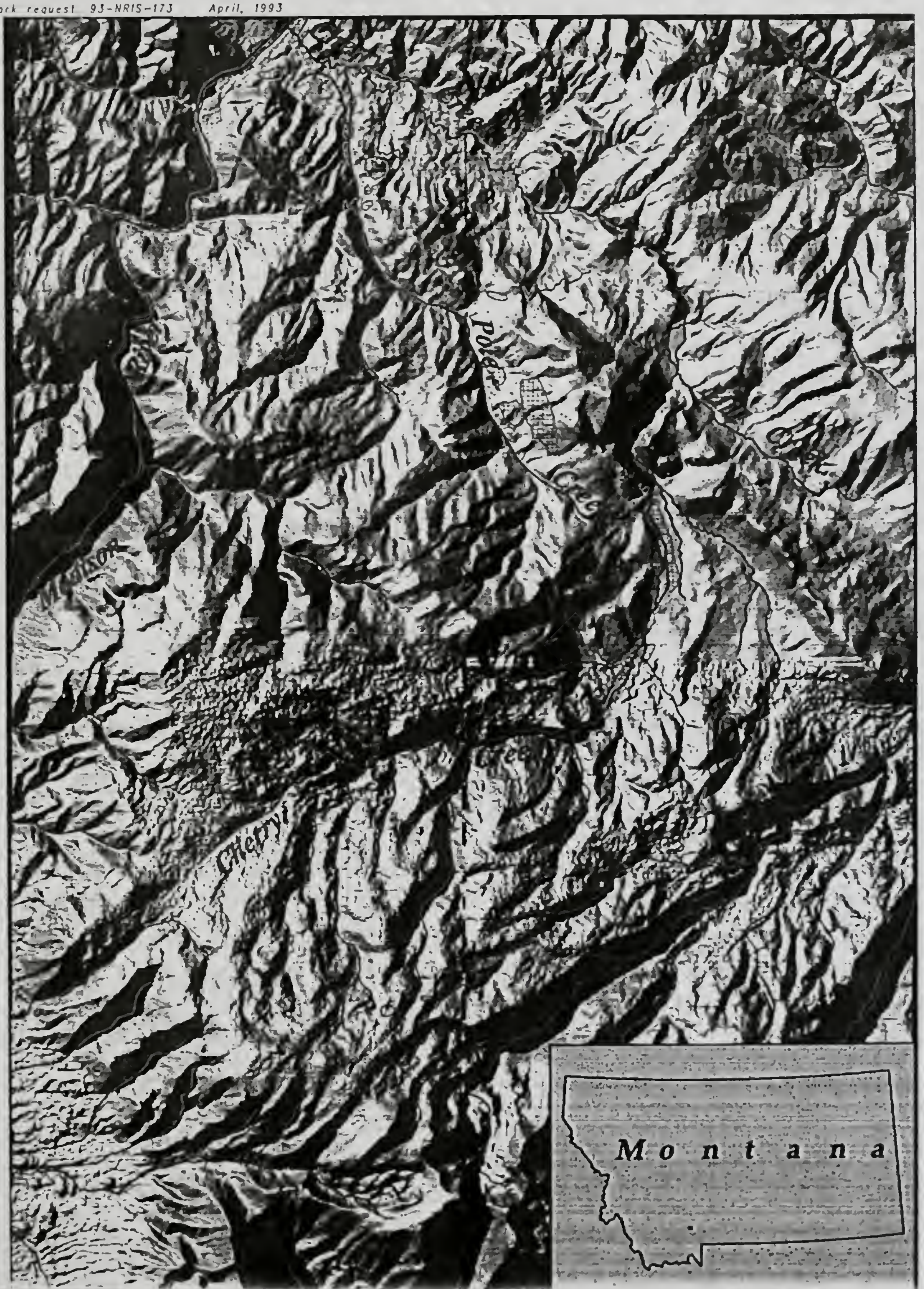
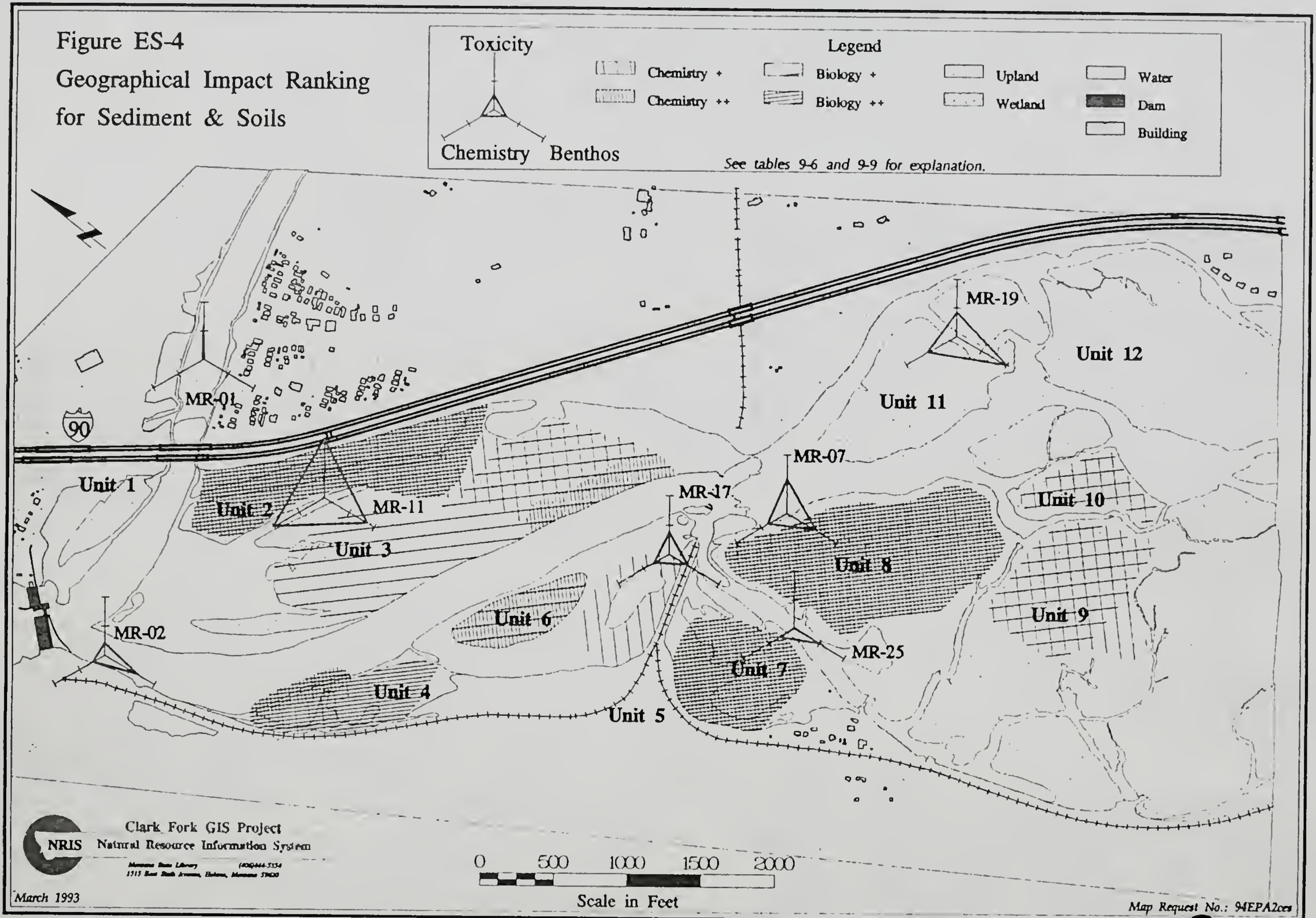
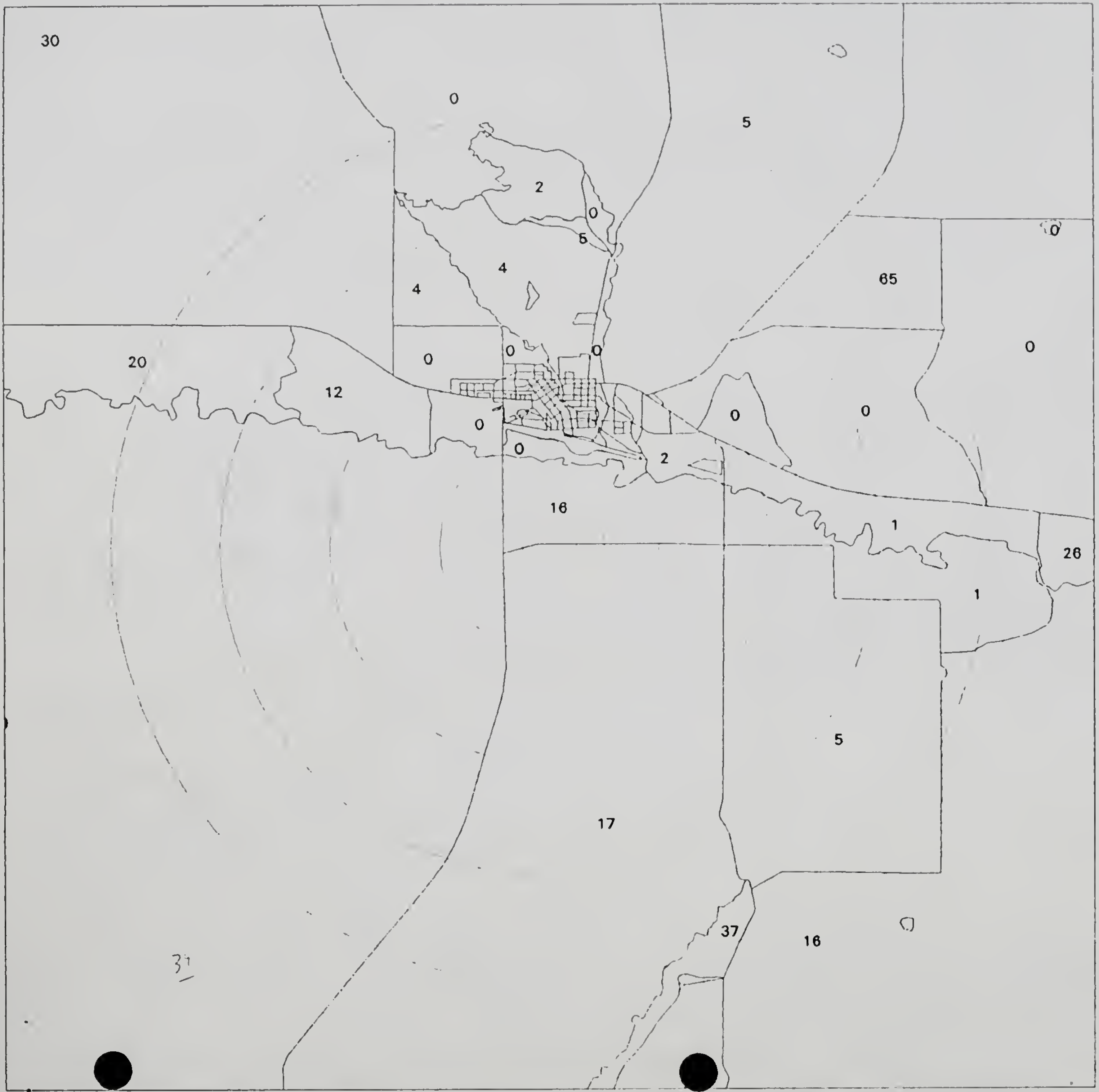


Figure ES-4
Geographical Impact Ranking
for Sediment & Soils

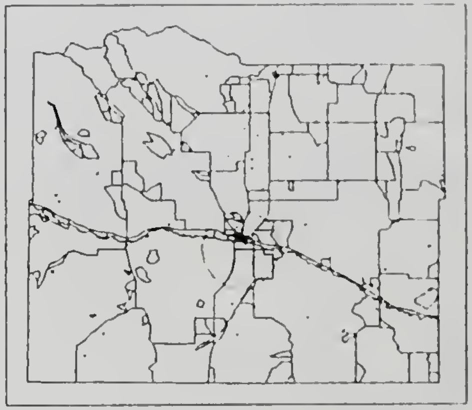


Harlowton



Distance (miles)	Population of Census Blocks which are inside circle Partially	Completely
4	1404	1168
3	1351	1141
2	1225	1141
1	74	0
0.5	72	0
0.25	33	0

Location Map
WHEATLAND County



Souce: U.S. Census Bureau PL 94-171 Files, 1990

Prepared by Natural Resource Information System
Montana S[illegible] Library
Map #93ep[illegible] 6/30/93

APPENDICES

Appendix A:	NRIS Service Evaluation
Appendix B:	Profile of NRIS Users: Charts/Graphs
Appendix C:	Examples of Information Requests
Appendix D:	New NRIS Information for FY 1993
Appendix E:	NRIS Factsheets

Appendix A: NRIS Service Evaluations
Patron Letter

Dear NRIS Patron:

The Montana Natural Resource Information System (NRIS) was formed in response to the growing need for quick access to the increasing amounts of natural resource information. NRIS was designed ... ***to be a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana.*** In 1985, NRIS began by providing services through its Montana Natural Resource Index and the Montana Natural Heritage Program. In response to growing user needs, the program has expanded to include the Montana Water Information System and the NRIS Geographic Information System. NRIS now offers a wide variety of data management, information indexing, and data retrieval services.

In an effort to continue to respond to user needs and to improve our services, we need your help. With your information request, we are enclosing a service evaluation form. Please help us better serve you by taking a few moments to fill it out. If you have any questions or want further information, please do not hesitate to call me or Pam Smith at 444-5354. In particular, if you encountered any problems with your request or were dissatisfied with the service you received, please contact me.

Thank you for your help and I hope we can be of service to you again.

Sincerely,

Allan B. Cox, Director
Montana Natural Resource Information System

Natural Resource Information System Service Evaluation

***Dear Patron:** Please help us improve our service by giving frank answers to as many of the following questions as you can. Please return this form to: **NRIS, Montana State Library, 1515 East 6th Ave, Helena, MT 59620 or Fax to (406) 444-0581**. Thank you.*

1. Did NRIS provide you with the information you requested? ___ Yes ___ No

2. How much of the information supplied did you apply or use? ___ <25% ___25%-50% ___50%-100%

   If you used "less than 25%" of the information supplied to you, please explain if NRIS supplied unnecessary or unusable information.

3. How dependent were you on NRIS to provide the information?
   ___ Very Dependent ___ Somewhat Dependent ___ Had other reliable source

4. Please estimate any financial benefits your department/project may have realized from the use of this information.
   ___ < $1,000 ___ $1,000 to $5,000 ___ $5,000 to $20,000 ___ > $20,000 (Specify) ________

5. Was the information given to you in a form that you can use? ___Yes ___No
   If NO, please explain why:

6. Did you receive the information on time? ___Yes ___No

7. In addition to this information request, how often have you used the services that NRIS provides?
   ___ Once a week or more ___ 1-3 times per month ___Several times a year ___About once a year
   ___ This was my first NRIS information request.

8. How important was it for you to obtain this information?
   ___ Very important ___ Somewhat important ___ Not very important ___ Not at all important

9. Did you verify the accuracy of the information we provided you? ___Yes ___No
   If YES, was the information/data accurate?

10. Do you have any comments or suggestions that might improve the services we offer?

11. Please indicate the organization type you represent:
    ___Federal ___Private (For Profit) ___Private (Non-Profit) ___State ___Academic ___ Individual ___Other (specify)

If you wish us to contact you concerning your answers or if you encountered problems with service, please give your name and phone number.

Name: ______________________________

Phone: ____________

Natural Resource Information System Patron Evaluations

During FY93, NRIS received over 48 responses to its Service Evaluation survey. Not everyone answered every question. The quantitative results are depicted below followed by some of the comments received.

---

1. Did NRIS provide you with the information you requested?

48	Yes
0	No

2. How much of the information supplied did you apply or use?

2	<25%
2	25%-50%
44	50%-100%

3. How dependent were you on NRIS to provide the information?

23	Very Dependent
22	Somewhat Dependent
3	Had other reliable source

4. Please estimate any financial benefits your department/project may have realized from the use of this information.

32	< $1,000
5	$1,000 to $5,000
1	$5,000 to $20,000
2	> $20,000 (Specify) ________

5. Was the information given to you in a form that you can use?

46	Yes
2	No

6. Did you receive the information on time?

48	Yes
0	No

7. In addition to this information request, how often have you used the services that NRIS provides?

1	Once a week or more
3	1-3 times per month
20	Several times a year
5	About once a year
18	This was my first NRIS information request.

8. How important was it for you to obtain this information?

24	Very important
17	Somewhat important
0	Not very important
0	Not at all important

9. Did you verify the accuracy of the information we provided you?

21	Yes
26	No

11. Please indicate the organization type you represent:

6	Federal
14	Private (For Profit)
1	Private (Non-Profit)
16	State
7	Academic
1	Individual
2	Other (County)

Sample Comments:

'In some cases [we have] verified data provided and found it to be accurate and useful"

"Yes, viewsheds were verified with site visits."

"access via modem would be helpful"

"excellent work! & timely"

we "appreciates the assistance your organization has provided."

"NRIS staff are helpful, cooperative, and a pleasure to work with."

"Connection to computer network (e.g. internet) to facilitate rapid data transfer"

"Provide more rapid turnaround of requests."

"Provide data in the most usable (CADD) format possible."

"Provide interpretive text along with data."

"From my limited use, I would have to say this is a great service! Being new to Montana, it has saved me alot of time and energy."

"Excellent and helpful service. Thank you Gerry Daumiller you saved me months of work!"

"Provide listing of main coverages you hold (for statewide themes) in MT GIS Newsletter."

"Things really looked great!"

"I was supplied with adequate information plus additional information I had not thought of using. Good job!"

"Doing good -- Thanks"

"Duane Lund was very helpful."

"I was very pleased with your services."

"Great maps! Great service! Thank you!"

"...just a thanks for all your help!"

"Thanks John for the truly great maps!"

"Everyone on your GIS team were very helpful, accommodating and patient. I really appreciate their help, especially that of John Jarvie."

"Try to set up task order contracts with the various agencies to facilitate contracting."

"Margaret and Cory-- Thank You"

"Nice map--excellent job -- Allan & Gerry -- Thanks a lot!"

"Everything was exactly as hoped for, even better."

"You were very helpful."

"Liked what we have seen so far--any problems we encountered were handled promptly by GIS."

"There should be more knowledge on transfer systems. There are needs for data not currently available at NRIS, regarding exporting"

Appendix B: Profile of NRIS Users: Charts/Graphs

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1. NRIS Data Requests by Fiscal Year
2. NRIS Users by Sector
3. NRIS Users by State Agency
4. Natural Heritage Program Users by Sector
5. Natural Heritage Program Users by State Agency
6. Water Information System Users by Sector
7. Water Information System Users by State Agency
8. Geographic Information System Users by Sector

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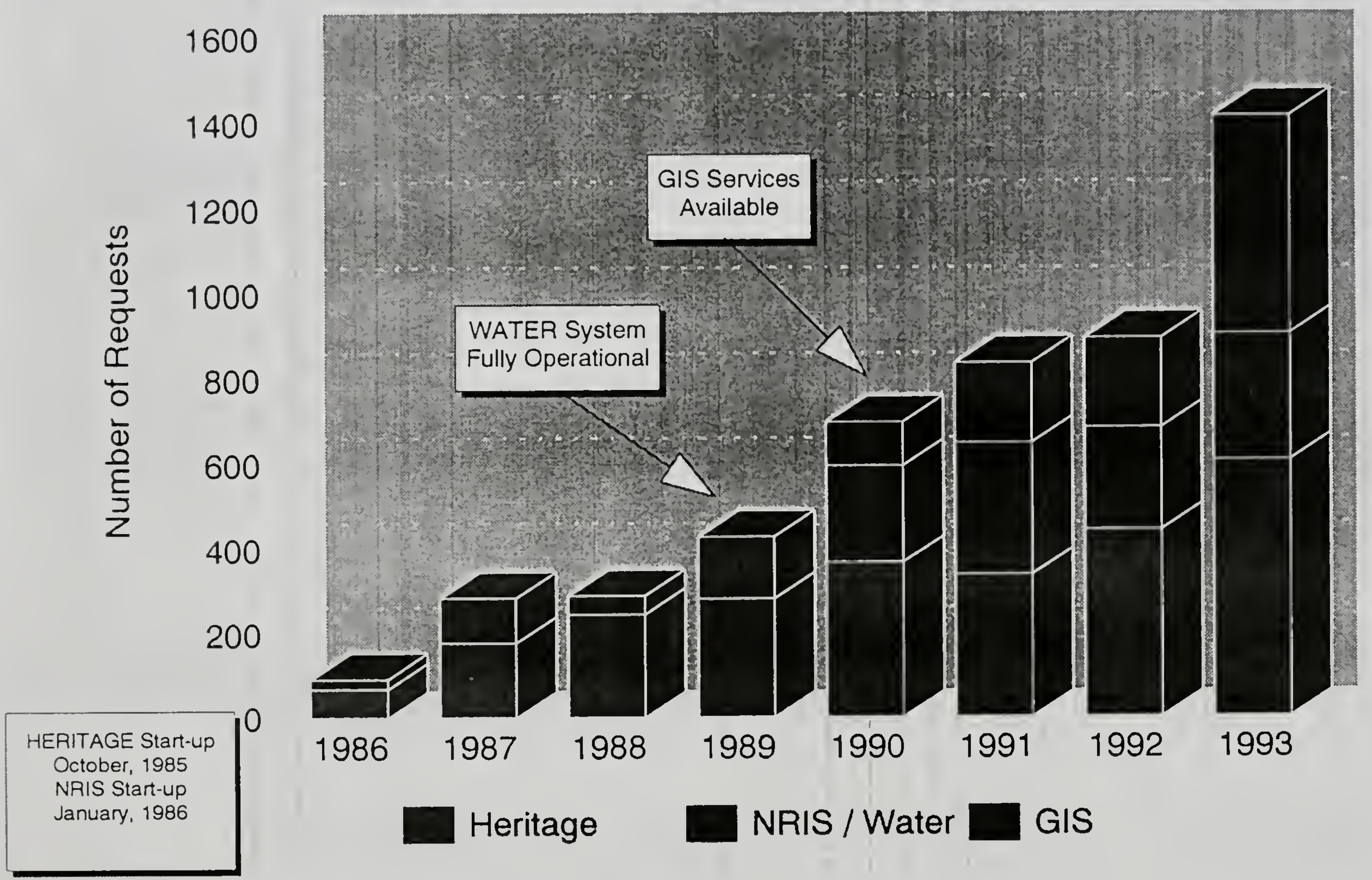
9. Geographic Information System Users by State Agency

Natural Resource Information System

Data Requests by Fiscal Year



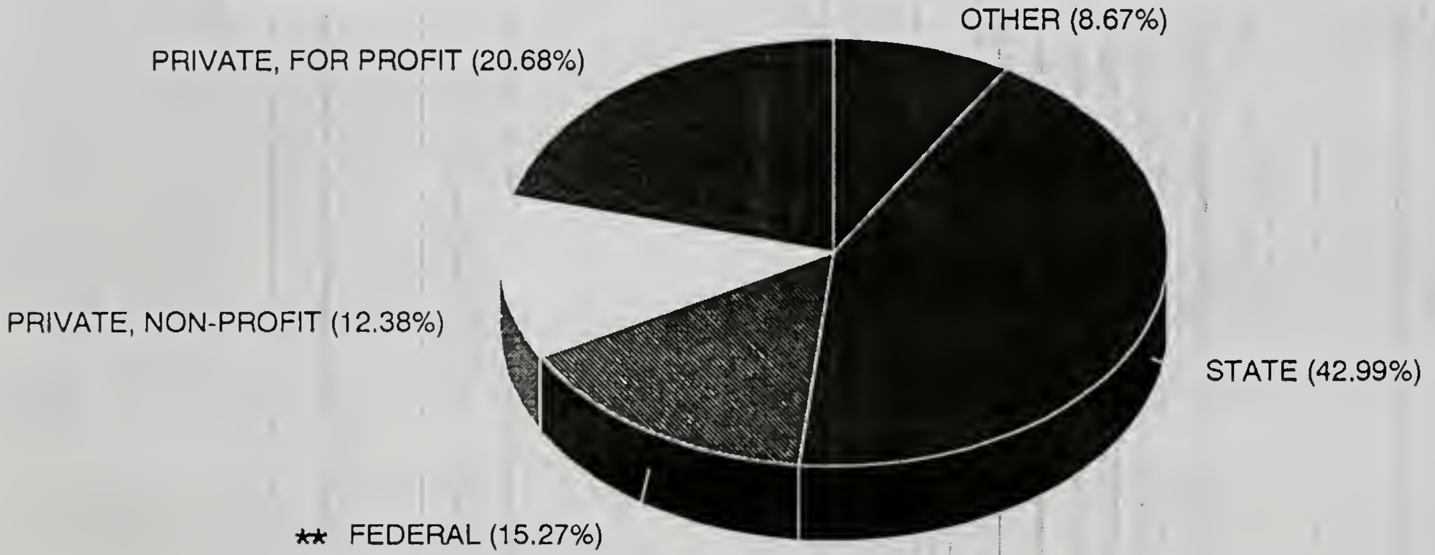
HERITAGE Start-up
October, 1985
NRIS Start-up
January, 1986

Natural Resource Information System
Users by Sector

Natural Heritage Program, Water Information System,
Geographic Information System

Total Requests:
1412

Period of Record: FY 1993



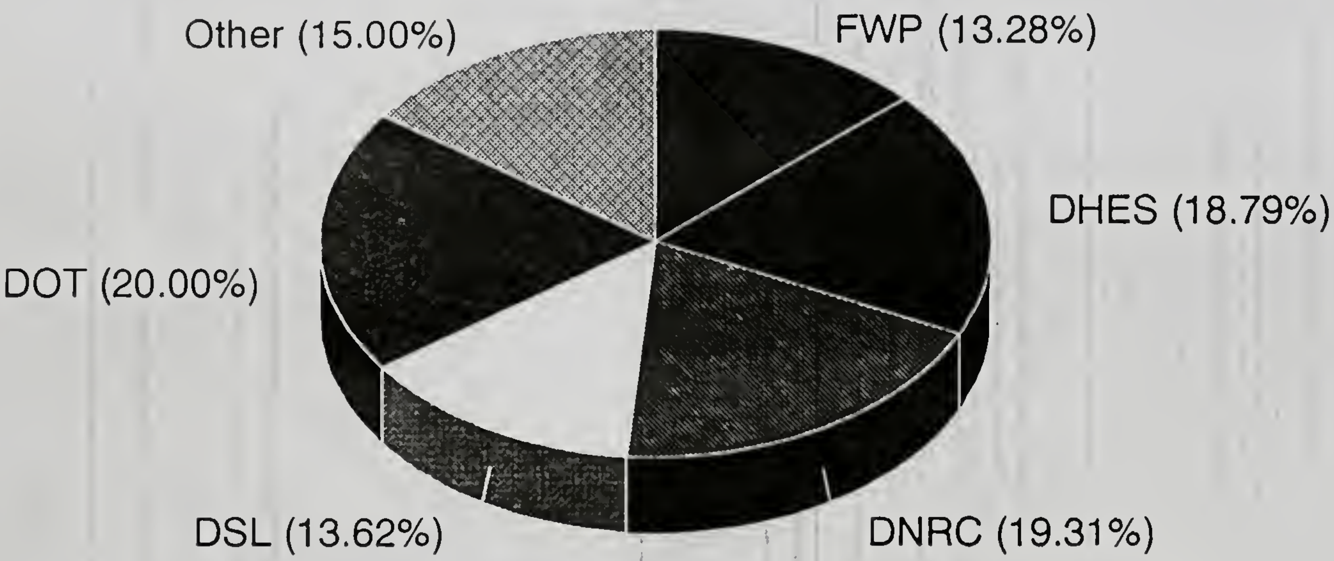
** Federal Sector reflects increasde use due to direct, on-line acess to the NHP Data Base

Natural Resource Information System

Users by State Agency

Natural Heritage Program, Water Information System,
Geographic Information System

Total Requests: 580

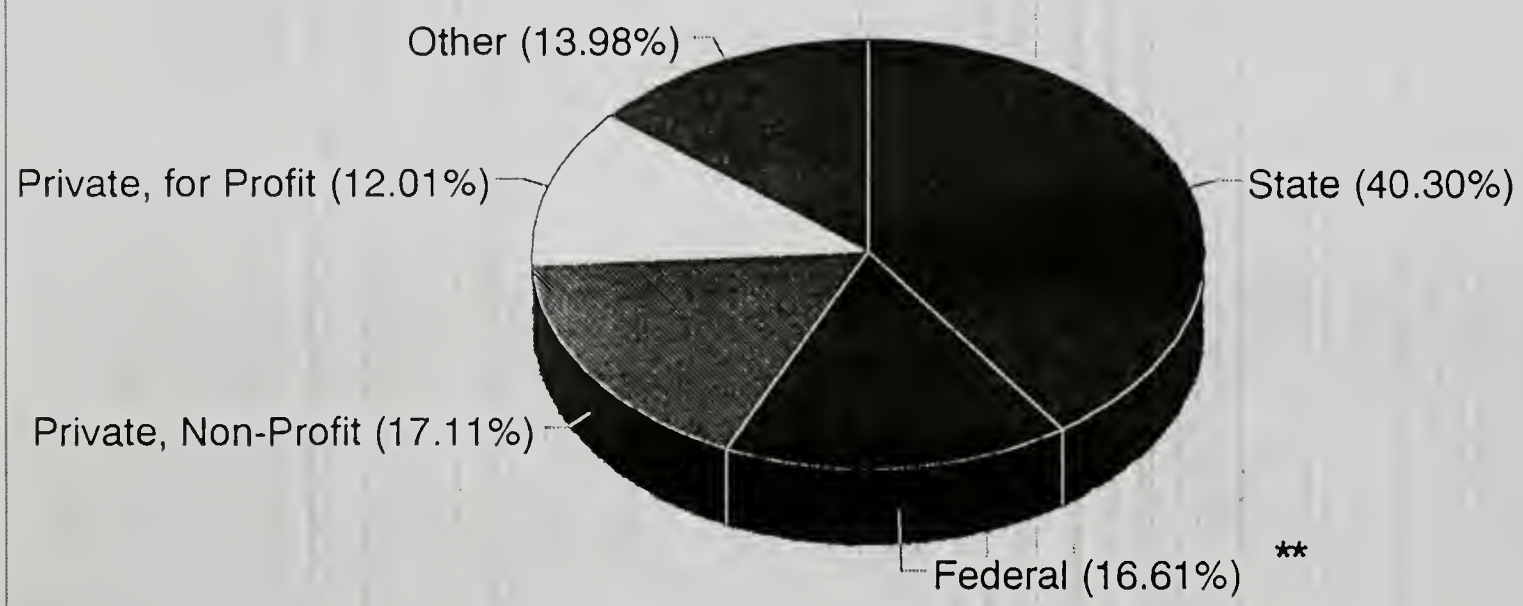


Period of Record: FY 1993

Natural Heritage Program
Users by Sector

Natural Resource Information System

Total Requests: 608



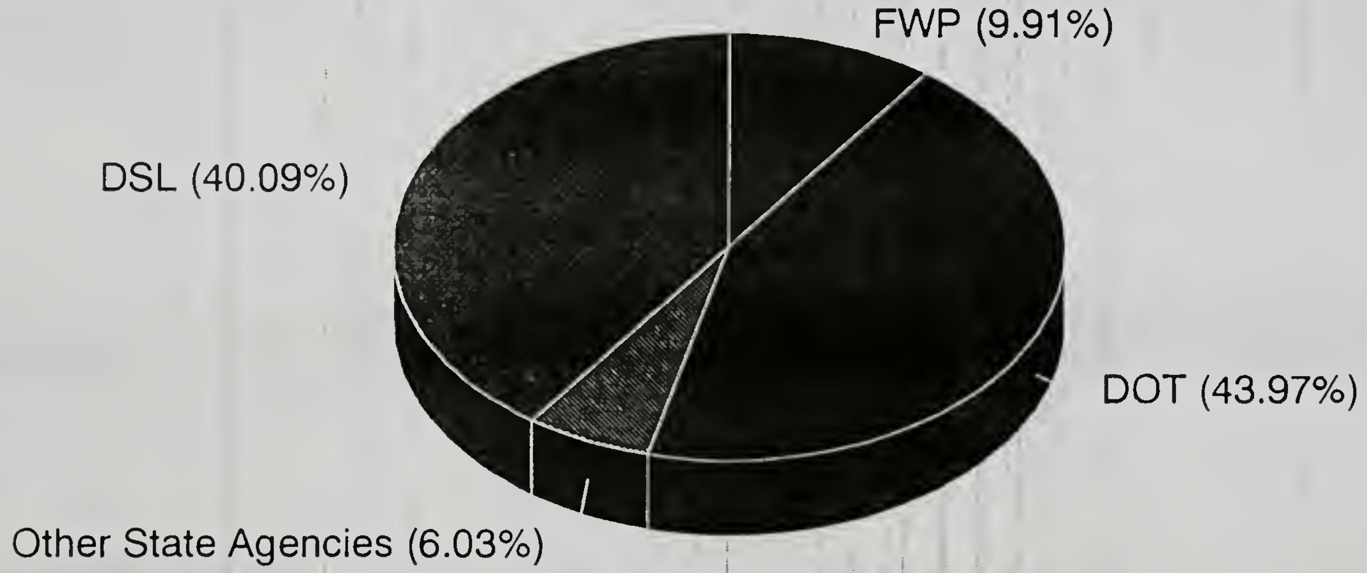
Period of Record: FY 1993

** Federal Sector reflects increased use due to direct, on-line access to the NHP Data Base.

Heritage Users
By State Agency

Natural Resource Information System

Total Requests: 245



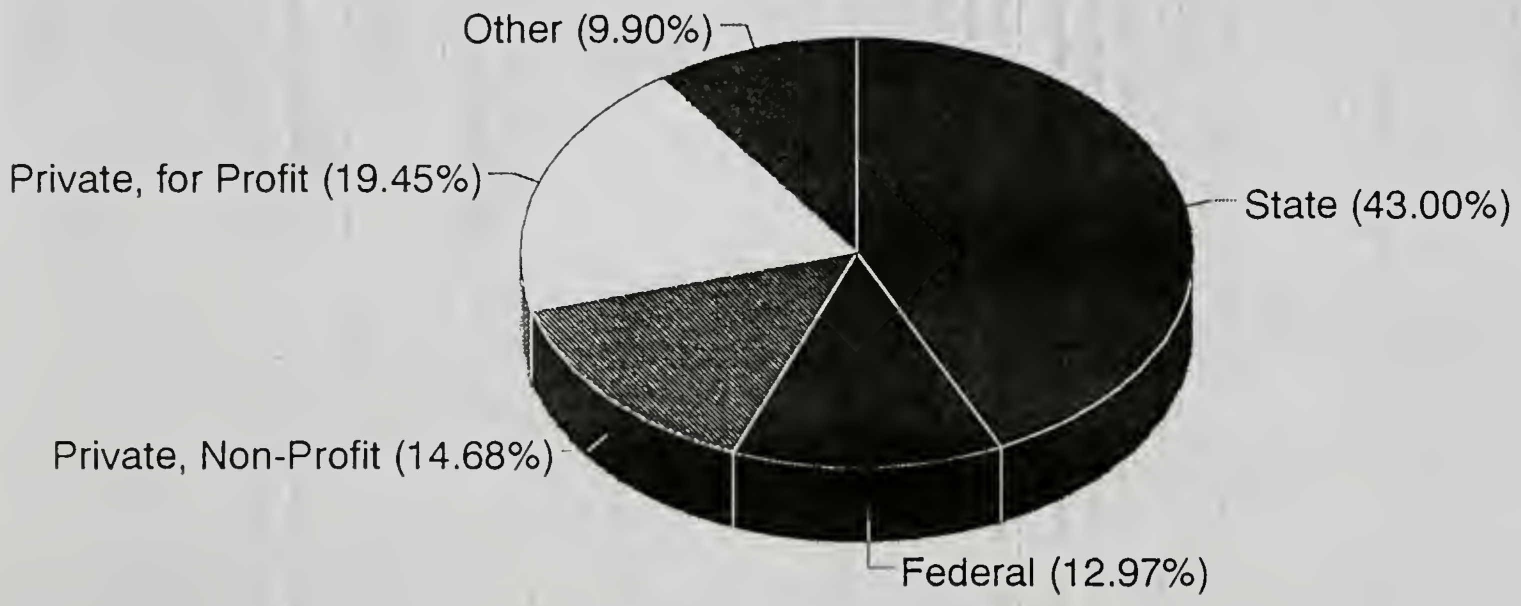
Period of Record: FY 1993

Water Information System

Users by Sector

Natural Resource Information System

Total Requests: 297

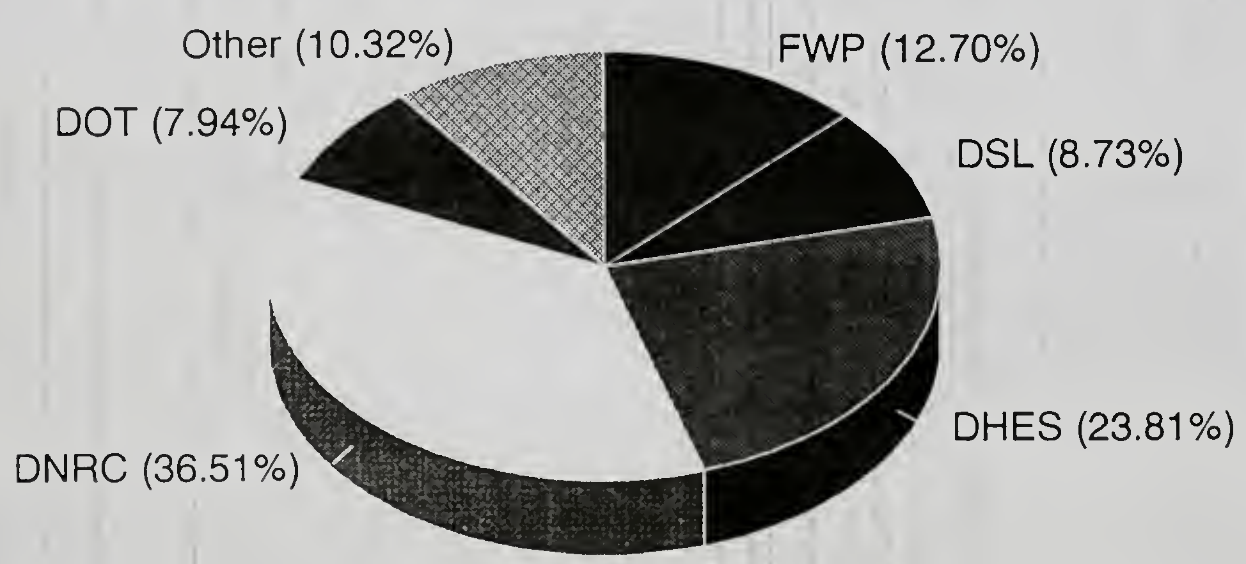


Period of Record: FY 1993

Water System Users
By State Agency

Natural Resource Information System

Total Requests: 128



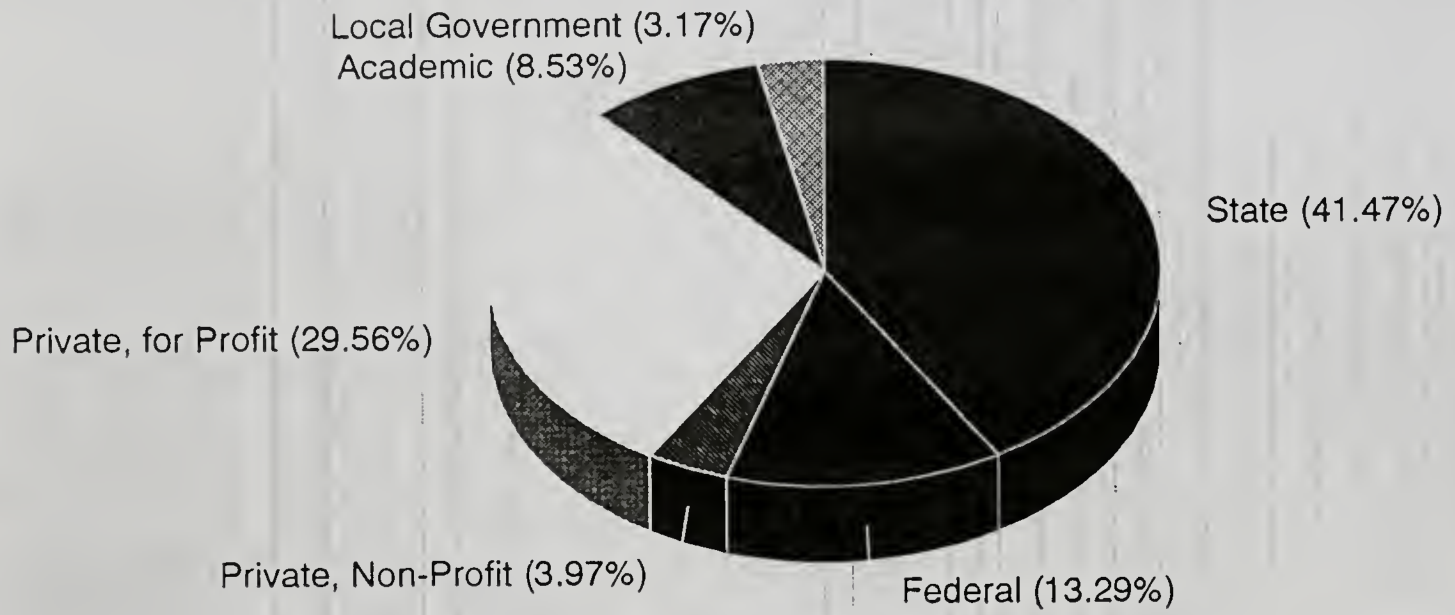
Period of Record: FY 1993

Geographic Information System

Users by Sector

Natural Resource Information System

Total Requests: 507

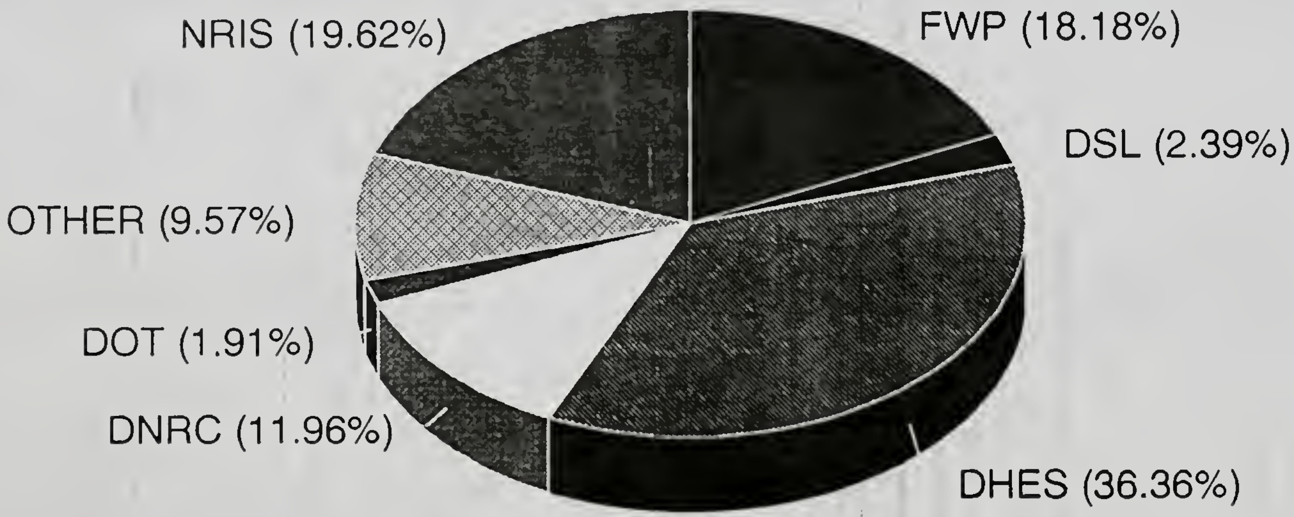


Period of Record: FY 1993

Geographic Information System
By State Agency

Natural Resource Information System

Total Requests: 209



Period of Record: FY 1993

Appendix C: Example Information Requests

- A state agency wanted training in GIS data processing techniques. GIS staff designed a GIS curriculum to meet the agency's needs. Each GIS staff member conducted research, developed lesson plans, and taught a section of the course. Topics covered included GIS data models, spatial data automation, attribute data automation, data display and database construction, attribute data manipulation, and spatial data manipulation. The GIS staff helped set up the agency's GIS hardware and software.

- For the Departments of State Lands and Fish, Wildlife and Parks, the Montana Natural Heritage Program supplied significant information and technical assistance on various projects. Some examples include:

    - Review of all opencut mining applications received by the Department of State Lands. This review numbered over 90 requests from January 1 - June 30, 1993.

    - A summary of bat species occurring in Montana, including information on the distribution, habitat and ecology of the species.

    - Regular review of DSL Oil and Gas Lease Sale tracts, and Abandoned Mine Reclamation sites for locations of sensitive species.

    - Location and status information for sensitive species within the Swan River and Stillwater State Forests.

    - Extensive bibliographic information on wildlife and wildlife habitat: this information included over 3,000 citations provided in both print form and in a dBase file searchable by subject fields.

    - Summaries of biological information for all amphibian species found in Montana.

    - Comments on the Blackfoot-Clearwater Wildlife Management Area Weed Control Environmental Assessment, regarding protecting sensitive species from herbicide applications.

    - Locations for over 3,000 occurrences of sensitive species in Montana, provided in a format compatible with the FWP Geographic Information System.

    - A listing of the location and status of sensitive species located on DSL-administered lands.

    - Updated lists of animal and plant species of special concern in Montana.

- A federal agency requested a map of all the wells used to take water quality samples in the area around Annaconda. The wells were plotted on a basemap showing contours, roads, and buildings. he patron wanted each well symbolized based on the company that created it. They used the map to perform field checks on the accuracy of the coordinate locations of the wells.

- A private contractor requested maps showing the Upper Clark Fork River Superfund areas. GIS staff reproduced five existing map products and delivered them the next day.

- A private non-profit organization requested statewide data sets of endangered species database, topography, landuse, land ownership, 1:250,000 digital elevation models, and highways. The Heritage program and the GIS worked together to provide the endangered species data. The GIS staff provided all the remaining data sets. Documentation was provided for all databases. Also an index of other available databases was provided. The digital elevation model database was too large for the client's system. The GIS staff worked to reduce the file to a size their system could handle.

- Staff at a Montana University GIS Lab requested hydrography data with feature names for Hill County. NRIS GIS staff extracted the requested information from the U.S. Census Bureau TIGER layer, converted the coordinate system to one used by the client, converted the data to a graphic interchange format, and then copied the data on the digital media requested by the client.

- A private hydrologic consultant conducting land assessment requested location and basic well information for domestic wells on the east side of Helena. Water Information System (WIS) staff provided well data from the Montana Bureau of Mines and Geology (MBMG) within a one mile radius of the area of interest. The WIS staff also provided an index map of the area using the ArcView- Software showing all of the wells in the area and their MBMG identification number.

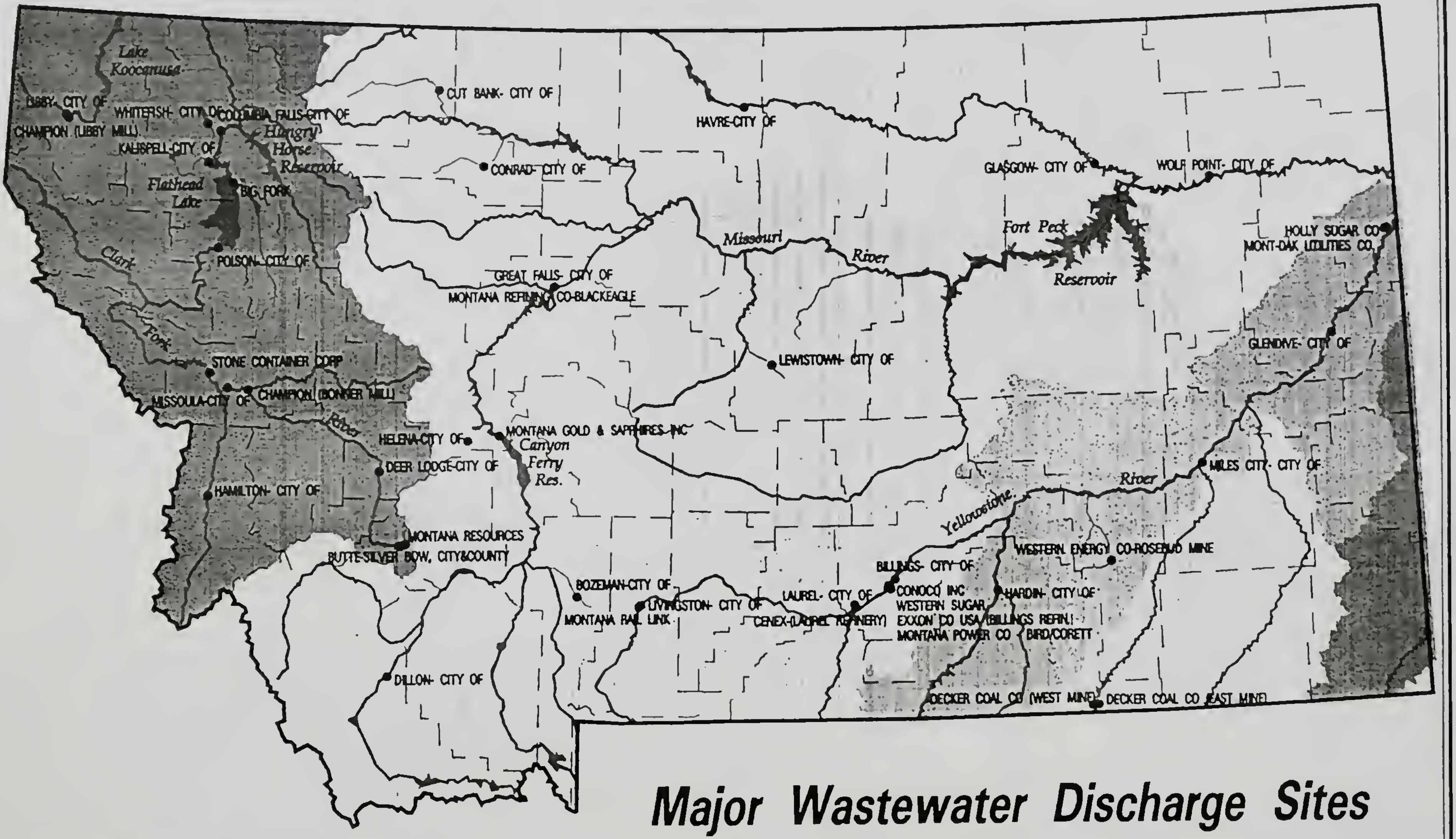
- Staff from a Tribal Government Water Resources Office requested locational data for all surface- and ground-water quality sites on, or within 5 miles of the Reservation Boundary. WIS staff provided an index listing of all of the site found within the USEPA STORET and USGS WATSTORE data bases.

- A local government agency requested information on heating degree days from several climate stations in the county. WIS staff retrieved data from the stations and performed simple calculations to generate the requested information.

- A federal agency requested location information and flood frequency data for an area in eastern Montana. The information will be used to determine dam structural design is adequate.

- A request from staff serving the Governor's Drought Advisory Committee for Surface Water Supply and Palmer Drought Severity Index maps. WIS and GIS staff provided several large maps for the committee meetings.

- A private consultant requested fisheries and other data for a corridor from Canada to Wyoming. WIS staff provided data from the Fish, Wildlife, and Parks (FWP) Montana Rivers Information System (MRIS), and from the USEPA STORET data base.



Major Wastewater Discharge Sites in Montana

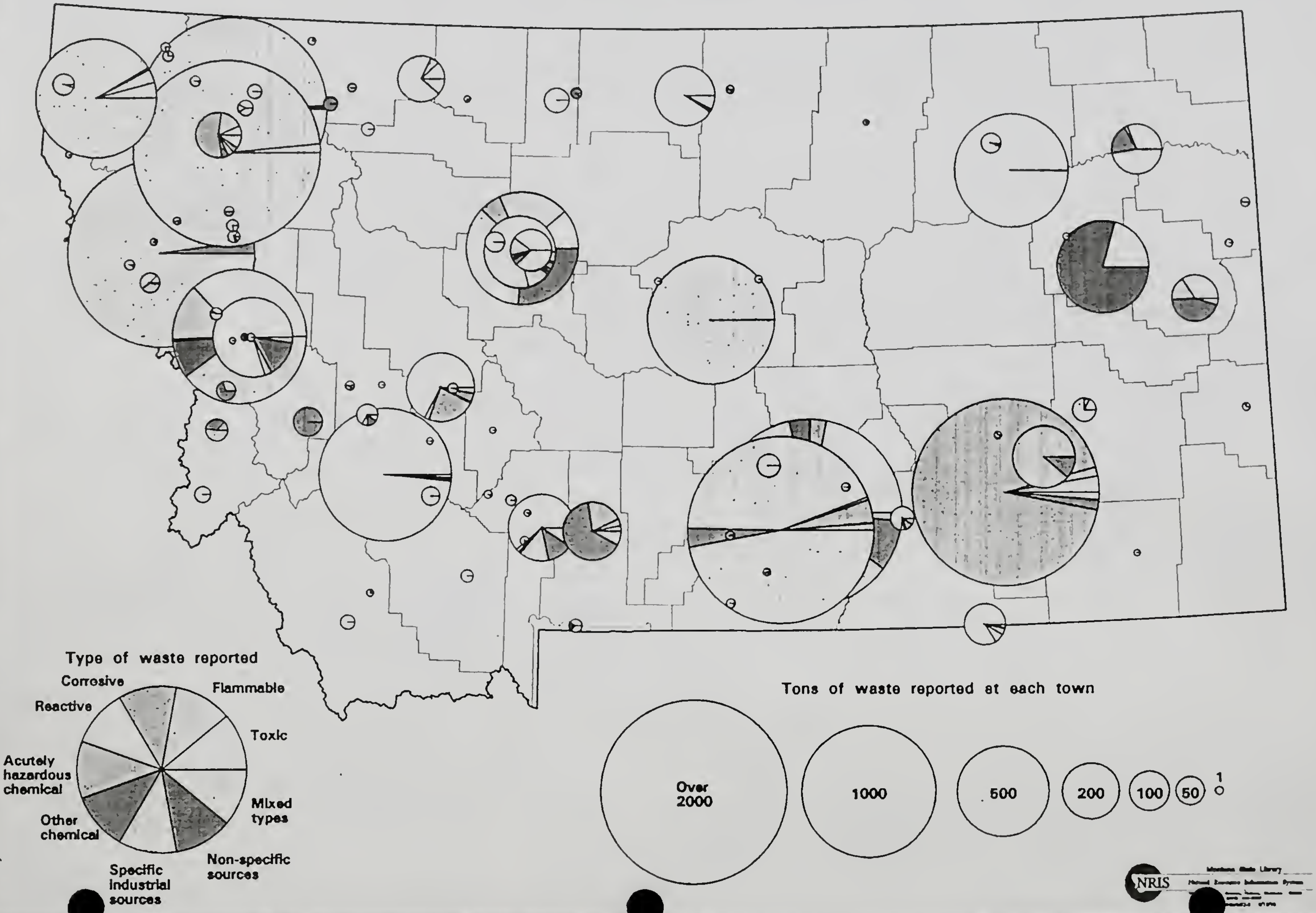
Note: the shaded areas show major USGS hydrologic units delineated at the sub-region level.

NRIS
Montana State Library

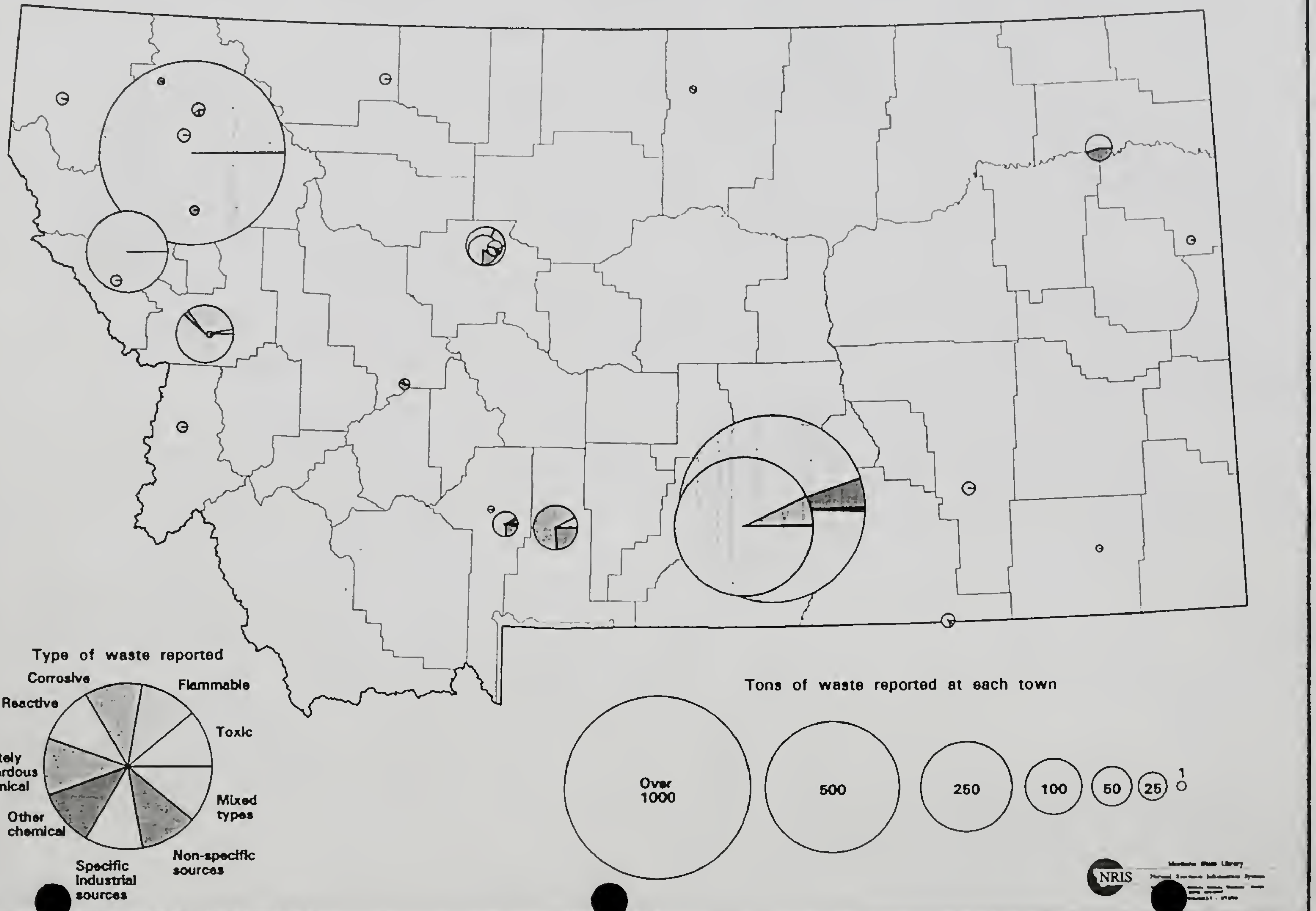
Work request 94-WQB-2 August, 1994

94nris52-8

Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1986 - 1992

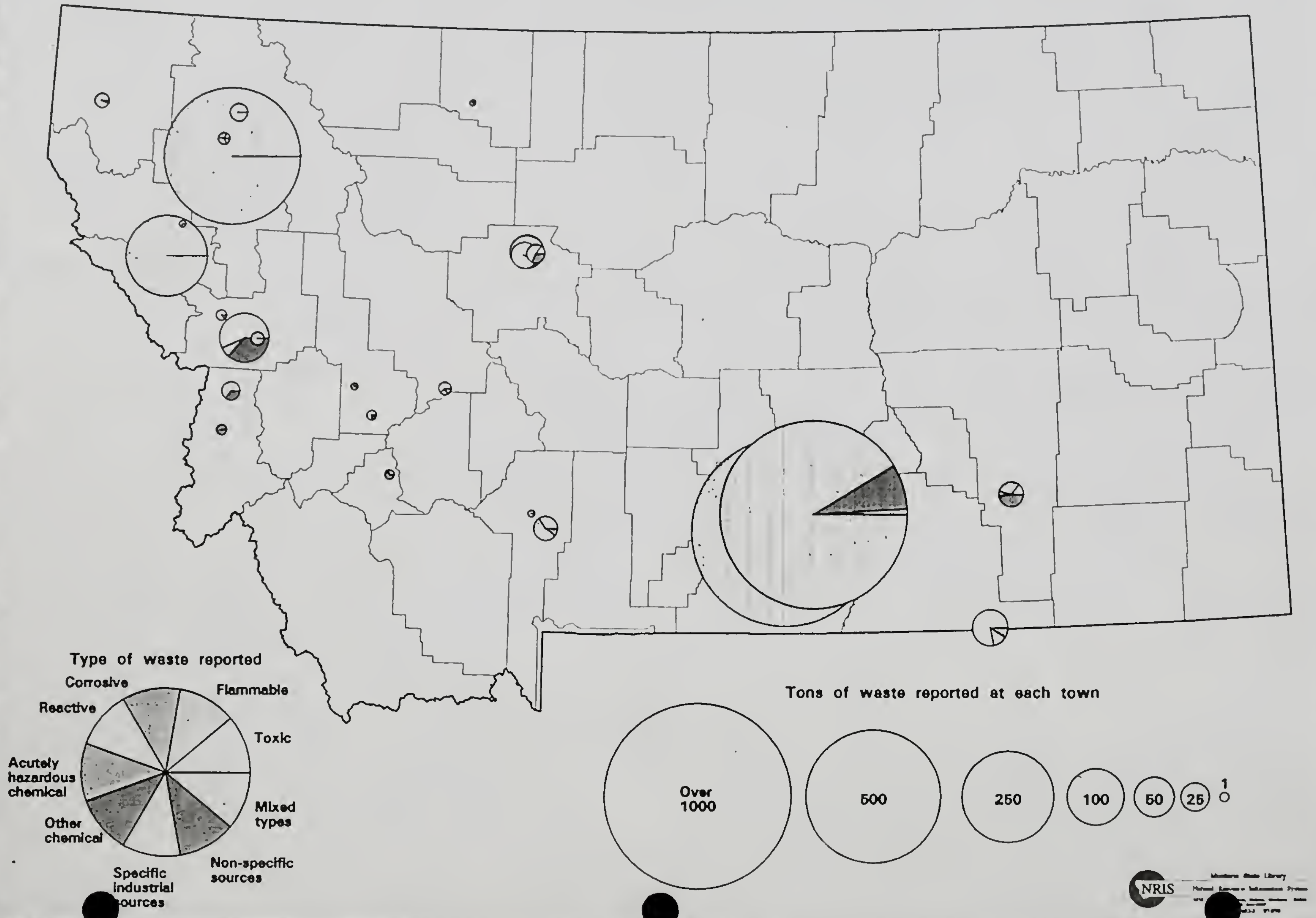


Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1986



94nris52-2

Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1987



Montana State Library
Natural Resource Information System
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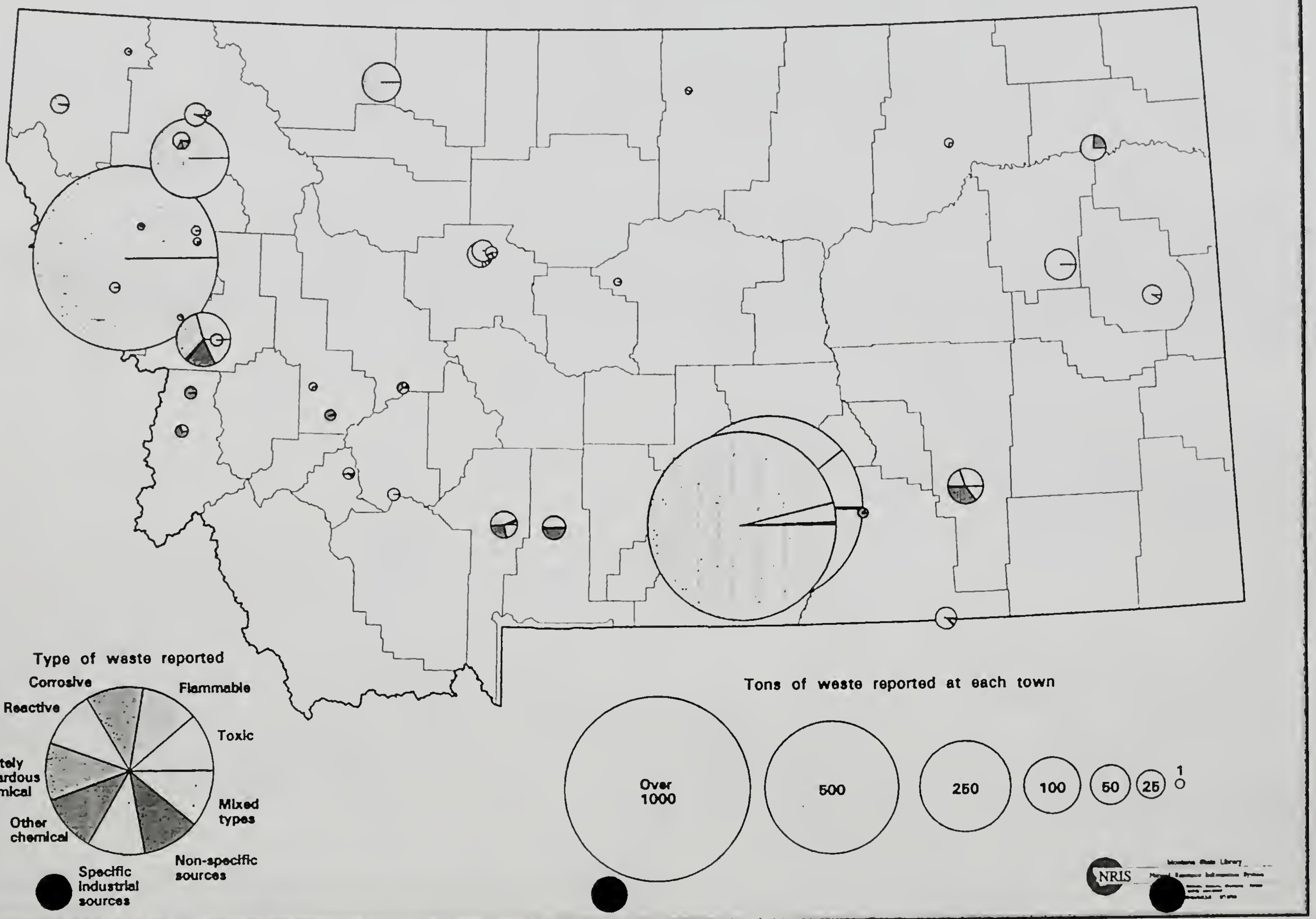
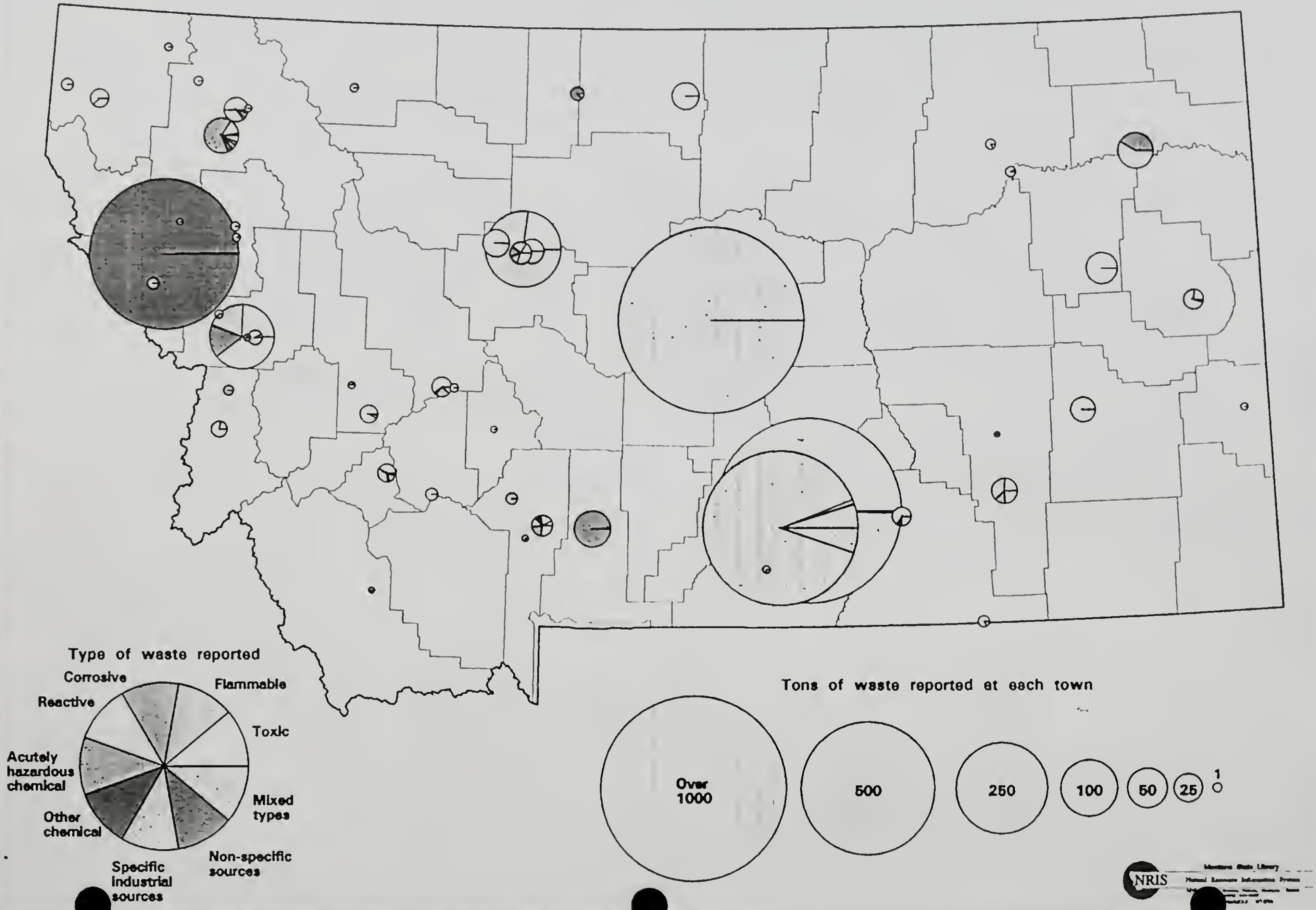
94nris52-3

Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1988

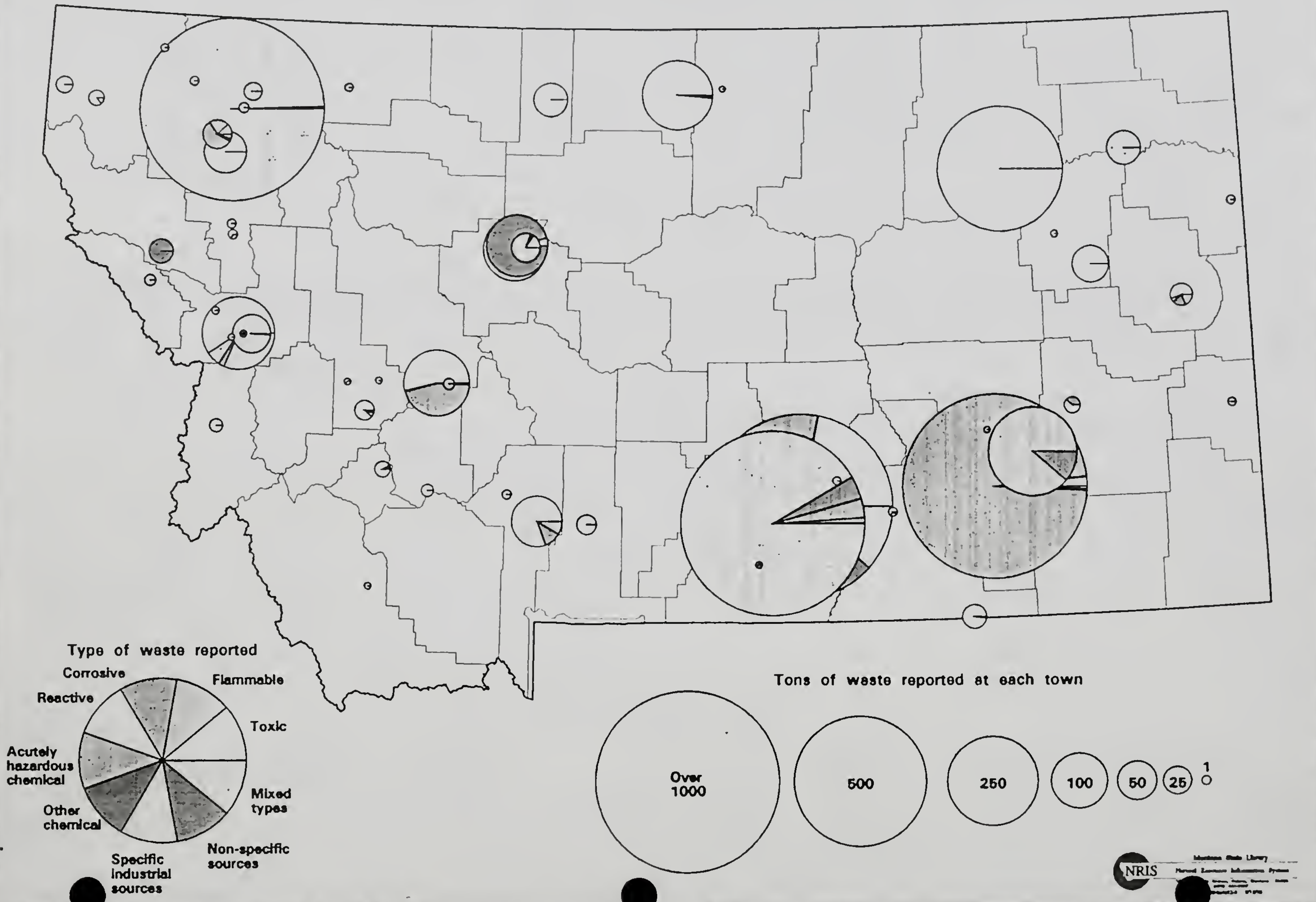


Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1990

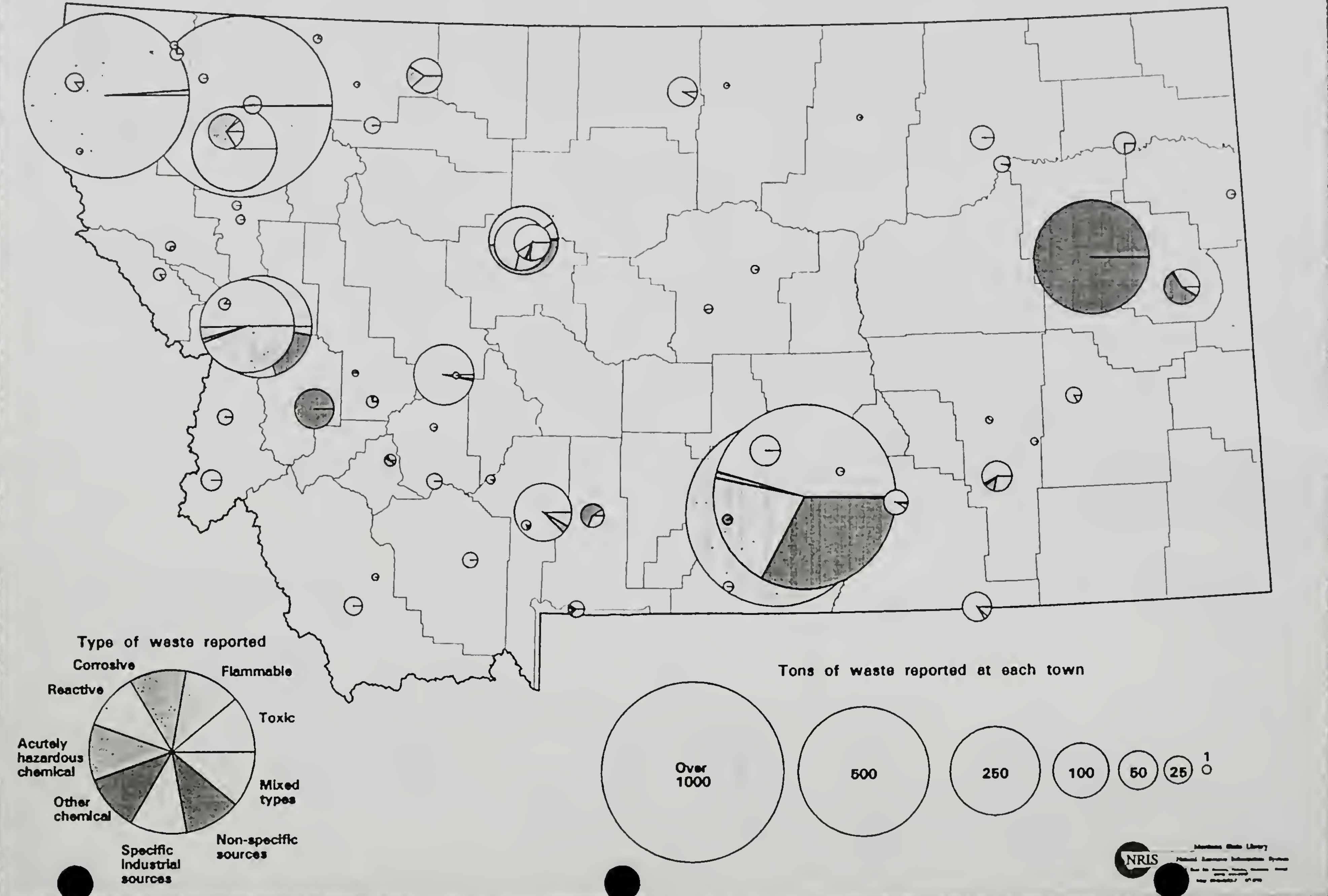


94nris52-6

Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1991



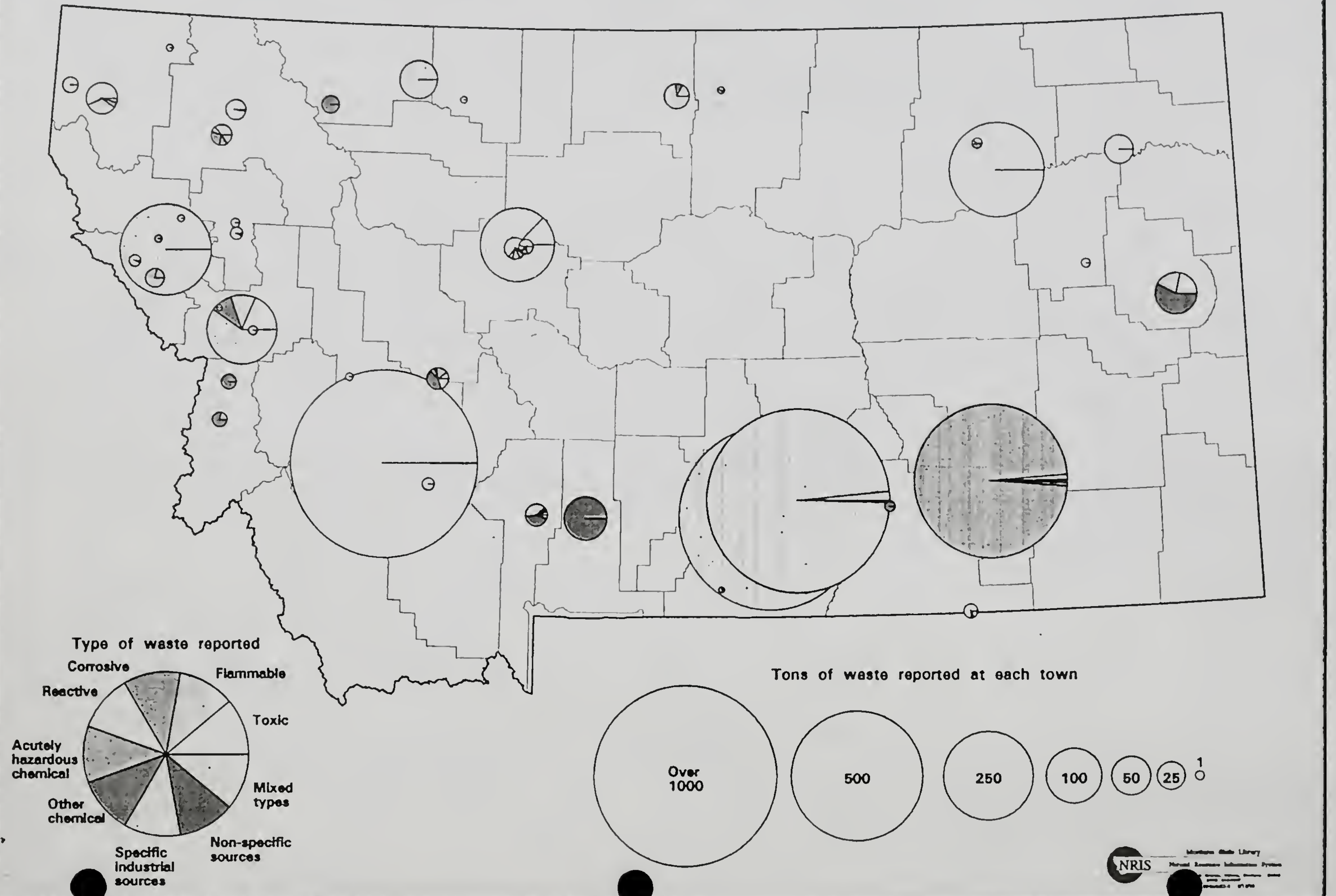
Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1992



Montana State Library
Natural Resource Information System
[illegible]

94nris52-4

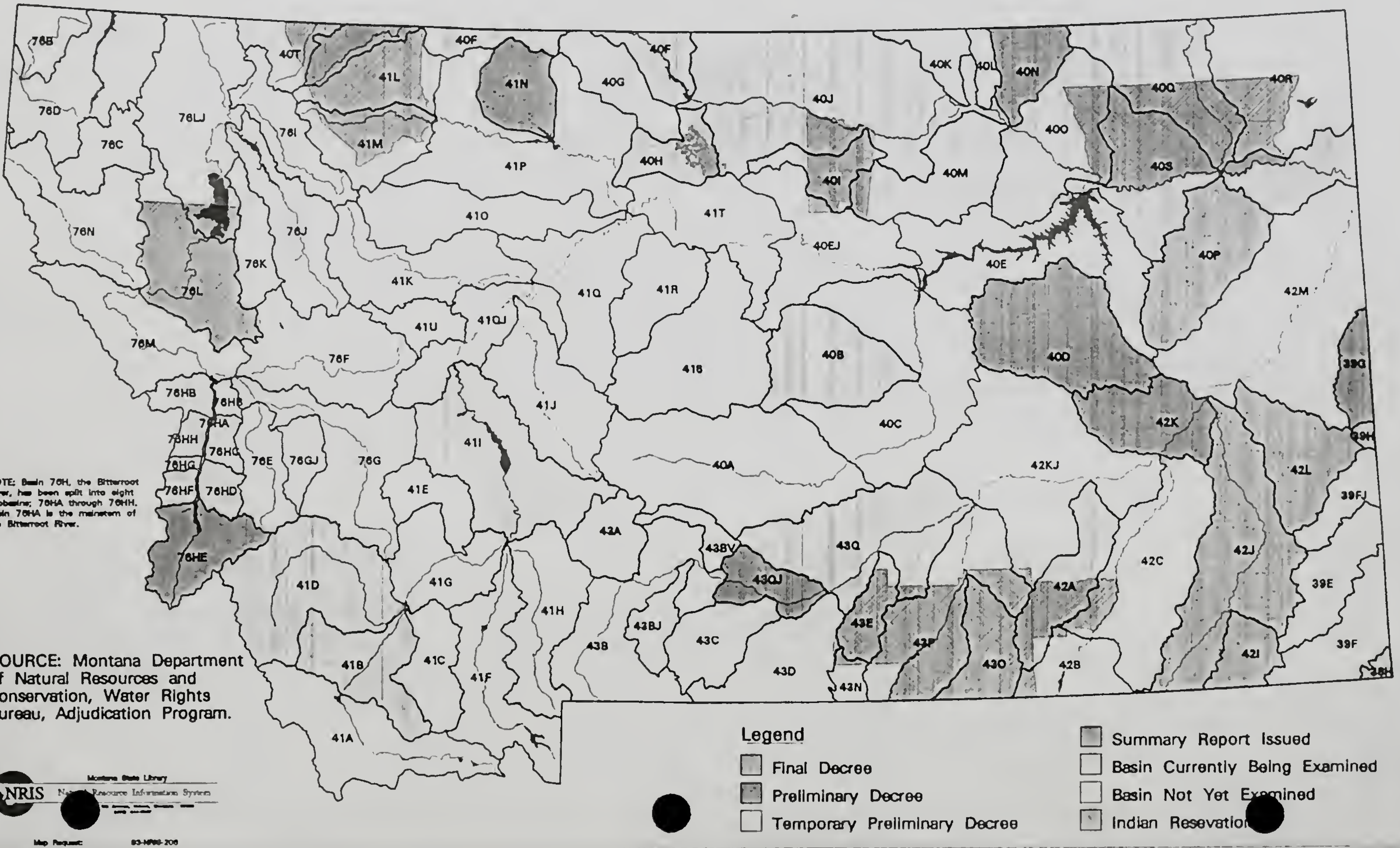
Hazardous Waste Reported to the Montana Solid & Hazardous Waste Bureau
1989



Montana State Library
Natural Resource Information System
[illegible]

Montana General Adjudication

Status As Of July, 1993



NOTE: Basin 76H, the Bitterroot River, has been split into eight subbasins; 76HA through 76HH. Basin 76HA is the mainstem of the Bitterroot River.

SOURCE: Montana Department of Natural Resources and Conservation, Water Rights Bureau, Adjudication Program.

Montana State Library
NRIS Natural Resource Information System

Map Request: 93-NR..-206

NATURAL HERITAGE PROGRAM

- Approximately 225 new location records for sensitive species were mapped and computerized. Several hundred records were also purged as the result of status or taxonomic changes. Approximately 50 new records of areas in Montana under special management were mapped and computerized, and modifications and updates occurred to vertebrate characterization abstract and species tracking records.
- Approximately 5,000 wildlife-related citations were added to the source abstract data base, the result of a joint project between the Heritage Program and Western Engineering and Technology, Inc. in Helena.
- The U.S. Forest Service in Missoula completed detailed site records on priority Research Natural Areas on Montana forests. This information was downloaded to the primary Heritage data bases in Helena.
- Approximately 1,400 new bird observation records were entered in conjunction with publication of the next edition of *Montana Bird Distribution*. Information continues to be solicited and processed.
- Approximately 20 technical reports were completed on sensitive species and/or areas.

WATER INFORMATION SYSTEM

STATEWIDE DATA
(Note: Many of these data bases are used to support the GIS coverages listed below).

- USGS - Locations and Basic Information of Landfills for Montana, and the other 49 States.
- USGS - General landuse data and GIS coverage for Montana, and the other 49 States.
- DHES - Number of Public Drinking Water Supplies using Ground Water per County.
- DHES - Number of each Class of Public Drinking Water Supplies using Ground Water per County.
- DHES - Total Population using Public Drinking Water Supplies from Ground Water per County.
- DHES - Number of Active Underground Fuel Storage Tanks per County.
- DHES - Number of abandoned Underground Fuel Storage Tanks per County.
- DHES - Number of Underground Fuel Storage Tanks removed per County.
- DHES - Number of Leaking Underground Fuel Storage Tanks per County.

- National Weather Service information listing site locations and the agency operating precipitation and climate stations in Montana.
- USGS Surface Water Discharge and Water Quality Monitoring information.
- USGS Temporary Surface Water Discharge and Water Quality Monitoring information.
- USGS WATSTORE - Ground Water Site Inventory (GWSI) information.
- USSCS SNOTEL precipitation, snow pack, and climate information.
- EPA STORET surface water quantity, surface water quality, and ground water quality and quantity data.
- 1993 Palmer Drought Severity Index values from the Montana Climate Center.
- 1993 Surface Water Supply Index from the USSCS Bozeman Office.
- Hydrologic and geologic data from the Montana Bureau of Mines and Geology (MBMG) to support the following GIS map coverages:
    - Alluvial Aquifers in the Western Intermontane Basins
    - Eastern Montana Alluvial Aquifers
    - Eastern Montana Geology
    - Late Tertiary / Early Quaternary Sand and Gravel Deposits
    - Water Well Locations from Drillers Logs
    - Water Quality Data from 7,700 Well Sites
- Listing of EPA Electronic Bulletin Board Systems.

- List of currently active Ground Water Projects.

GEOGRAPHIC INFORMATION SYSTEM

STATEWIDE DATA LAYERS

- Geographic Names Information System - Place names for features depicted on USGS maps.
- SPOT satellite scene centers for Montana
- USGS 24k Digital Line Graph and Digital Elevation Model availability
- USFS Cartographic Feature File availability
- TIGER Line Files for all of Montana

- Census Geography for all of Montana, with population by race and voting age
- Research Natural Areas Boundaries - Approximately 40% of State
- Current and abandoned mine sites from U.S. Bureau of Mines and Department of State Lands
- U.S. Environmental Protection Agency ecologic regions
- Department of Transportation County Map Series Files
- U.S. Environmental Protection Agency and Montana Department of Health and Environmental Sciences and Nonpoint Source Reference Streams
- Old USGS Water Shed Basins (Pre HUC)
- USGS Ground Water Supply Index
- USGS Permanent Flow and Water Quality Monitoring Sites
- USGS Temporary Flow and Water Quality Monitoring Sites
- Locations of climate stations for which Palmer drought index values are calculated.
- Areas for which Surface Water Supply Index (SWSI) values are calculated.
- WATSTORE - ground water site inventory stations, surface water flow stations.
- SNOTEL stations including a variety of climate stations.
- New EPA STORET Sites
- Palmer Drought Severity Index
- Surface Water Supply Index
- Montana Fish, Wildlife, and Parks Lands
- U.S. Fish and Wildlife Service Lands
- Alluvial Aquifers
- Surface Bedrock
- Flaxville Gravel
- Water Well Locations
- Water Quality Monitoring Wells
- Western Intermontane Basins

REGIONAL DATA LAYERS

- Annotation for 42 Clark Fork Base Maps
- Proposed Old Works golf course in Anaconda
- Clark Fork Data Management System metal concentration data
- Wells near Harrison Avenue in Butte with water levels
- Land Ownership along Silver Bow Creek
- Silver Bow Creek 20-foot contours generated from digital elevation model data
- Census data for Butte and Missoula
- Clark Fork ArcViews
- Anaconda Upland Soils samples from Natural Resource Damage Program
- Butte area monitoring wells
- Anaconda Upland Soils control samples
- Butte area tailings from 1955 aerial photo
- Natural Resource Damage Program Clark Fork impact and control transects
- Updated Waste Rock Dump boundaries
- Remedial Response Units in Anaconda
- Anaconda Flue Dust Sites
- Anaconda Land Ownership
- Montana Pole area well locations with elevations
- Contaminated areas (surface and subsurface)
- LNAPL Plume in the Montana Pole area
- Received Montana Pole ownership boundaries in Autocad format (Not imported)
- Anaconda Area Wells with Elevations
- New Waste Rock Dumps (stipulated to in 1992)
- Proposed Existing Irrigation turn-outs for Upper Clark Fork River
- Water Sample Values for Warm Springs Ponds
- Toxicology Sample Locations and Values for Milltown Reservoir

- Previously Reclaimed Areas Around Opportunity Ponds and Anaconda Ponds
- Helena National Forest Streams - Hydrology
- Helena National Forest Cultural Sites
- Helena National Forest Big Game, Recreation, Wildlife, Wilderness Areas
- Helena National Forest Digital Elevation Models

Appendix E: NRIS Factsheets